

STRUCTURE OF THE MICROCARD

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A02 = Special features/—1
test speci-
fications
A01 = Structure of
microcard —A— **XXX XX*XX XXXXX XX
B01 = 2 —B— *XXXX XXXXX XXXXX XXXXX XXXXX XXX
C— XXXXX XXXXX XXXXX XXXXX XXXXX XXX
D— XXXXX XXXXX XXXXX XXXXX XXXXX XXX
E— XXXXX XXXXX XXXXX XXXXX XXXXX XX
F—
G—
H—
J—
K—
L—
M—
N—
XX*
12345 67890 12345 67890 12345 678
1 2

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N28 = Table of contents and publication information

1 = Tools and devices

2 = Complete instructions, divided into test steps (no references)

a. Read from left to right.

b. Title of micropicture (appears on each coordinate).

E16	Product/component/test step	
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Coordinate

c. Limits of section

$\boxed{==>}$	$\boxed{<==>}$	$\boxed{<==}$	$\boxed{=> <=}$
Beginning	Mid- section	End	One-page section

A01	—	=> <=
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SPECIAL FEATURES

The microcard contains the repair and test instructions including the appropriate test values for the alternators 0 120 485 ..
KK—>14V

Note:

Alternator 0 120 485 007 was used to draw up these repair and test instructions. Refer to the appropriate service-part micro-cards for the various alternator versions.

The KK alternator is a new Bosch design and was first installed in the VW Passat Diesel as of late 1986. The distinguishing characteristics of this alternator are:

- * 2 small internal fans
- * External mini collector rings (12 mm)
- * External sandwich-construction rectifier
- * Monolith voltage regulator
- * Stator mounting in drive-end-bearing housing
- * Cooling channels
- * B-end frame with plastic cover
- * Allen-head shaft
- * Double-flow ventilation

A02	—	⇒ <=
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ELECTRICAL TEST VALUES

Interference-suppression capacitor 1,8...2,6 micro-farad

Load current $\leq 10A$

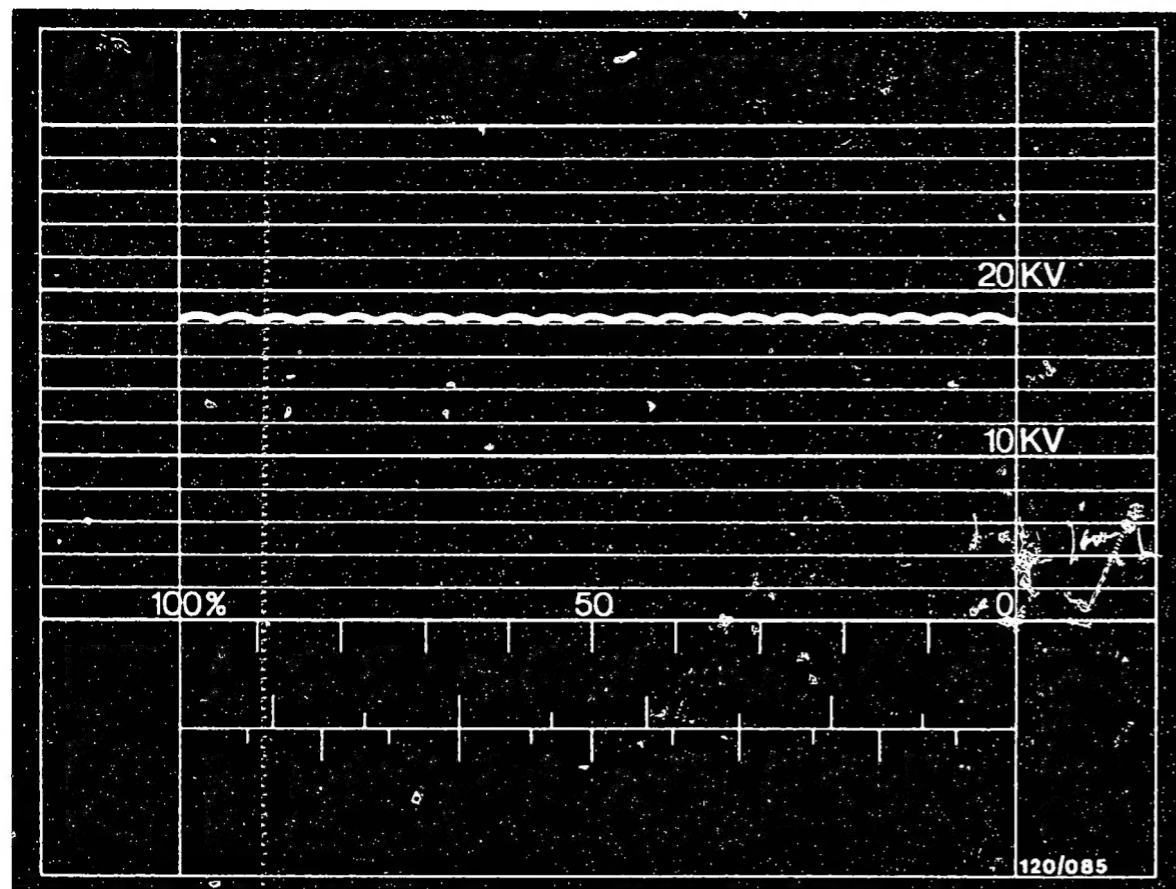
Voltage-regulator part number	Control voltage V
1 197 311 210	13.7...14.5

Performance testing + resistance values
Stator/rotor

Requirements for testing:

- * Observe direction of rotation of the alternator. The rotational-direction arrow is found on the protective cover.
- * The protective cover must be mounted on the alternator, as otherwise overheating would ruin the alternator.
- * Testing alternator with voltage regulator: Adjust control voltage to 13 V.
- * Let alternator run at a speed of 6000 min⁻¹ for 15 minutes on the test bench. The alternator must be at operating temperature (approx. 60°C) for testing.

Alternators	Performance testing with voltage regulator min ⁻¹		Resistance values Ω + 10%	
		(A)	Stator	Rotor
0 120 485 ...				
KK(->)14V28/70A	1500 6000	28 70	< 0.1	2.6



Oscilloscope display O.K.:

If the alternator is O.K., the above oscilloscope pattern will be displayed. The DC voltage has a slight ripple.

The pattern can exhibit small peaks when the voltage regulator comes into operation. The regulator can be stopped by means of switching loads (e.g. load resistor).

Adjust the pattern height so that the ripple is contained between two adjacent kV lines.

In order to be able to compare such patterns, the pattern concerned is to be adjusted with the vertical control of the oscilloscope so that it fits approximately between the 10 kV and 20 kV lines.

N o t e : More than one defect may be present at one time.

MECHANICAL TEST VALUES

Air gap between rotor and stator
> 0,35 mm

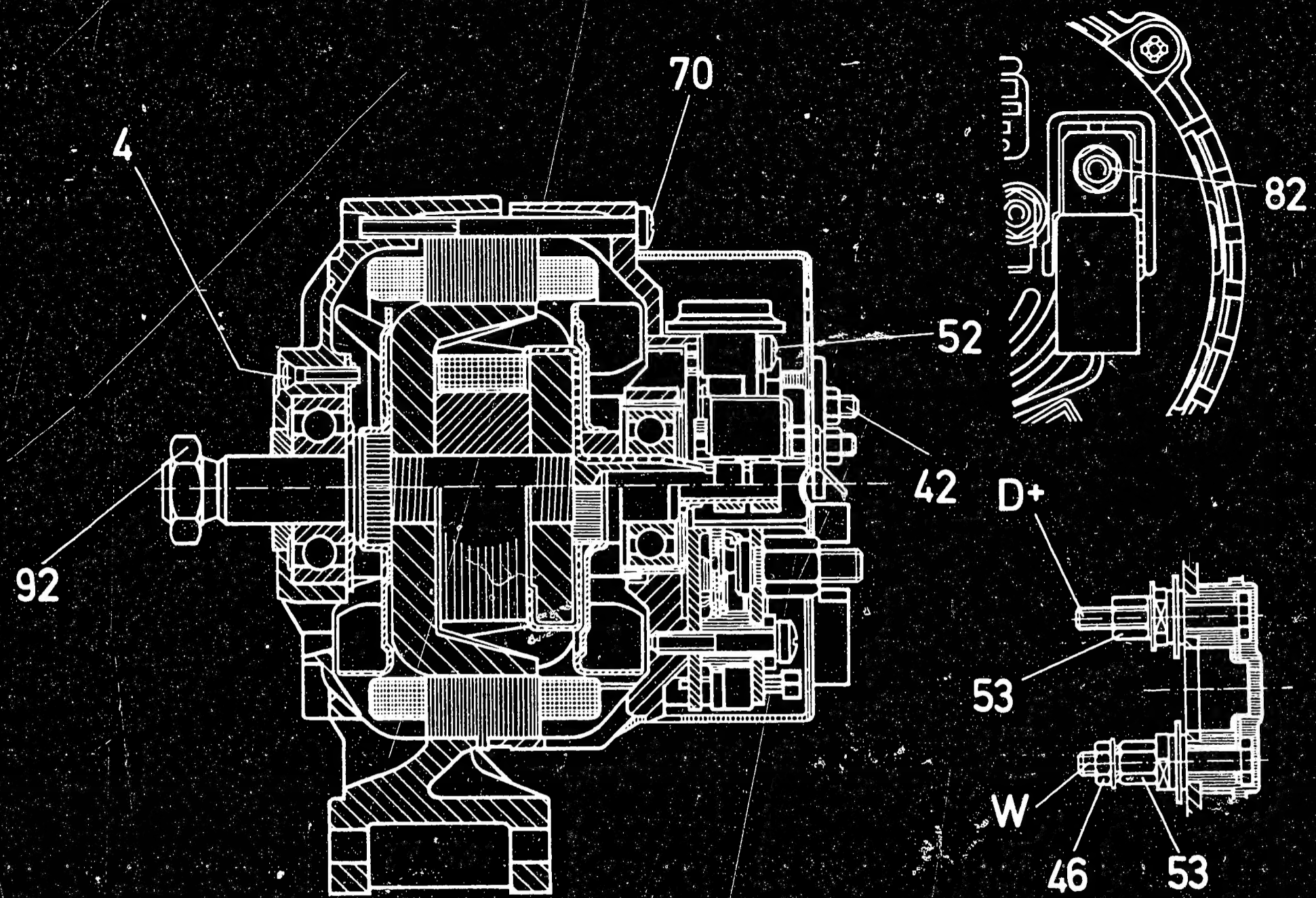
Concentricity deviations:

Outside diameter of rotor 0,05 mm

Outside diameter of collector rings 0,03 mm

Minimum diameter of collector rings and carbon-brush projection (see table)

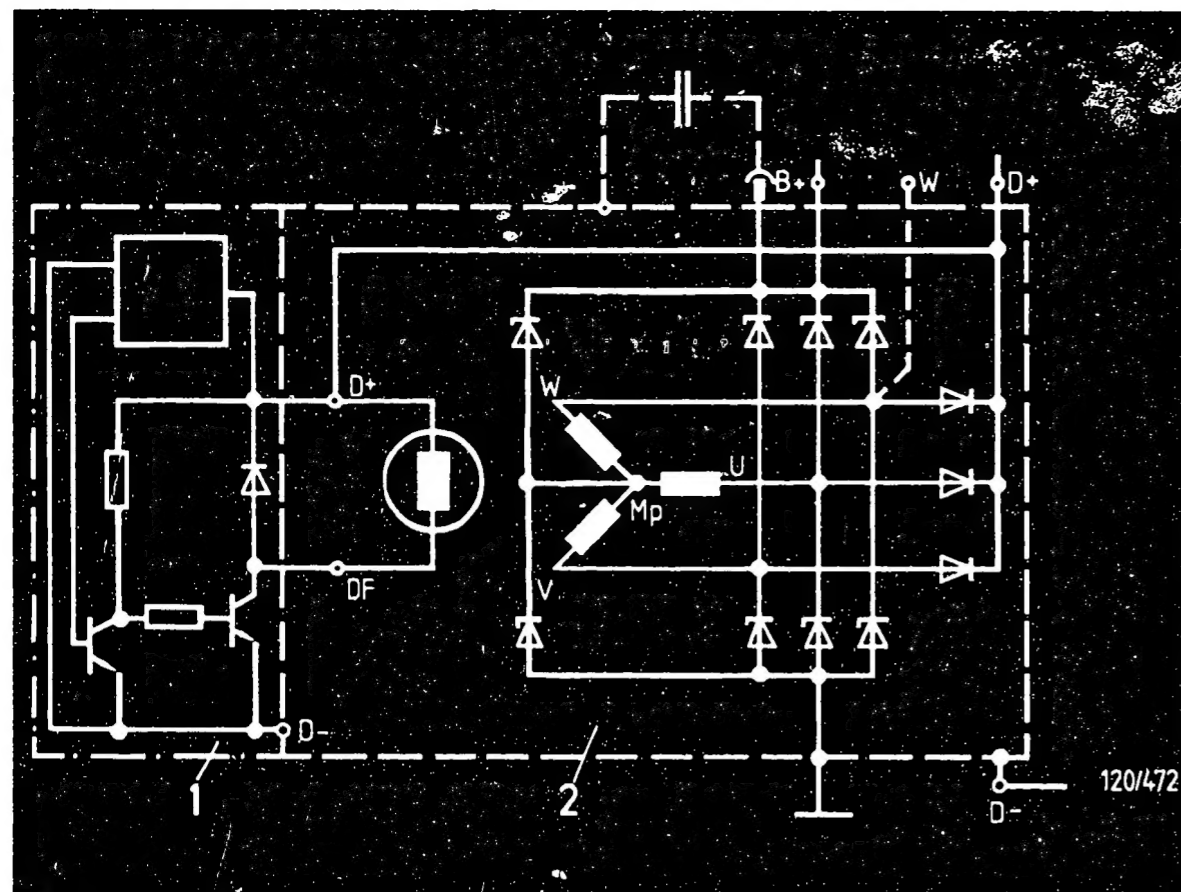
Alternators	Collector ring diameter (mm)		Carbon-brush projection (mm)	
	new	min. dia.	new	min.
0 120 485 ...	12.0	10.5	10...11	5



120/471

KK-ALTERNATOR TIGHTENING TORQUES

Item 4 = 2,7...3,5 Nm	Item 53 = 3,2...4,0 Nm
Item 42 = 3,5...4,3 Nm	Item 70 = 4,5...5,5 Nm
Item 46 = 3,2...4,0 Nm	Item 82 = 3,2...4,0 Nm
Item 51 = 1,6...2,3 Nm	Item 92 = 45... 55 Nm

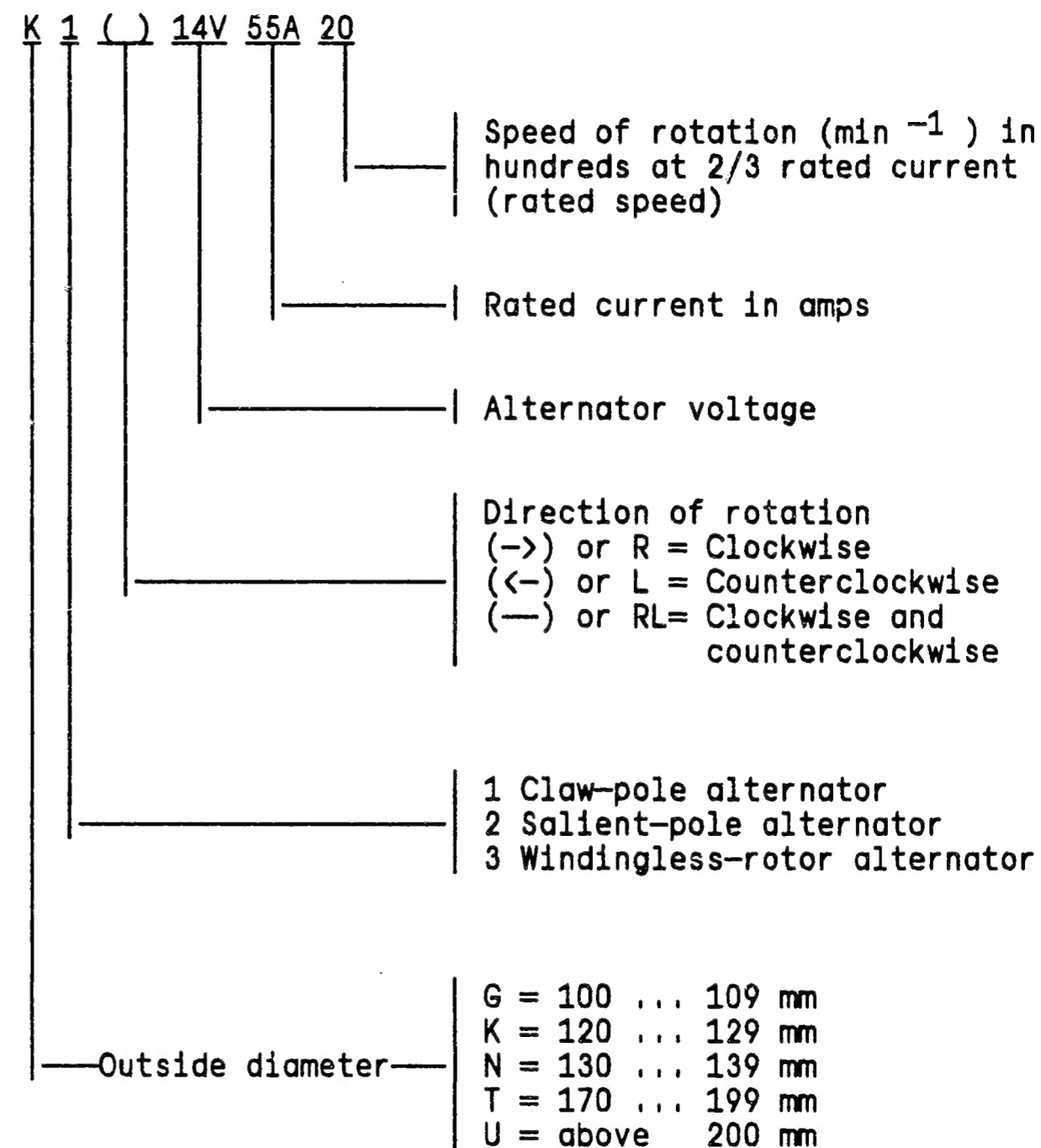


1 = Voltage regulator
2 = Alternator

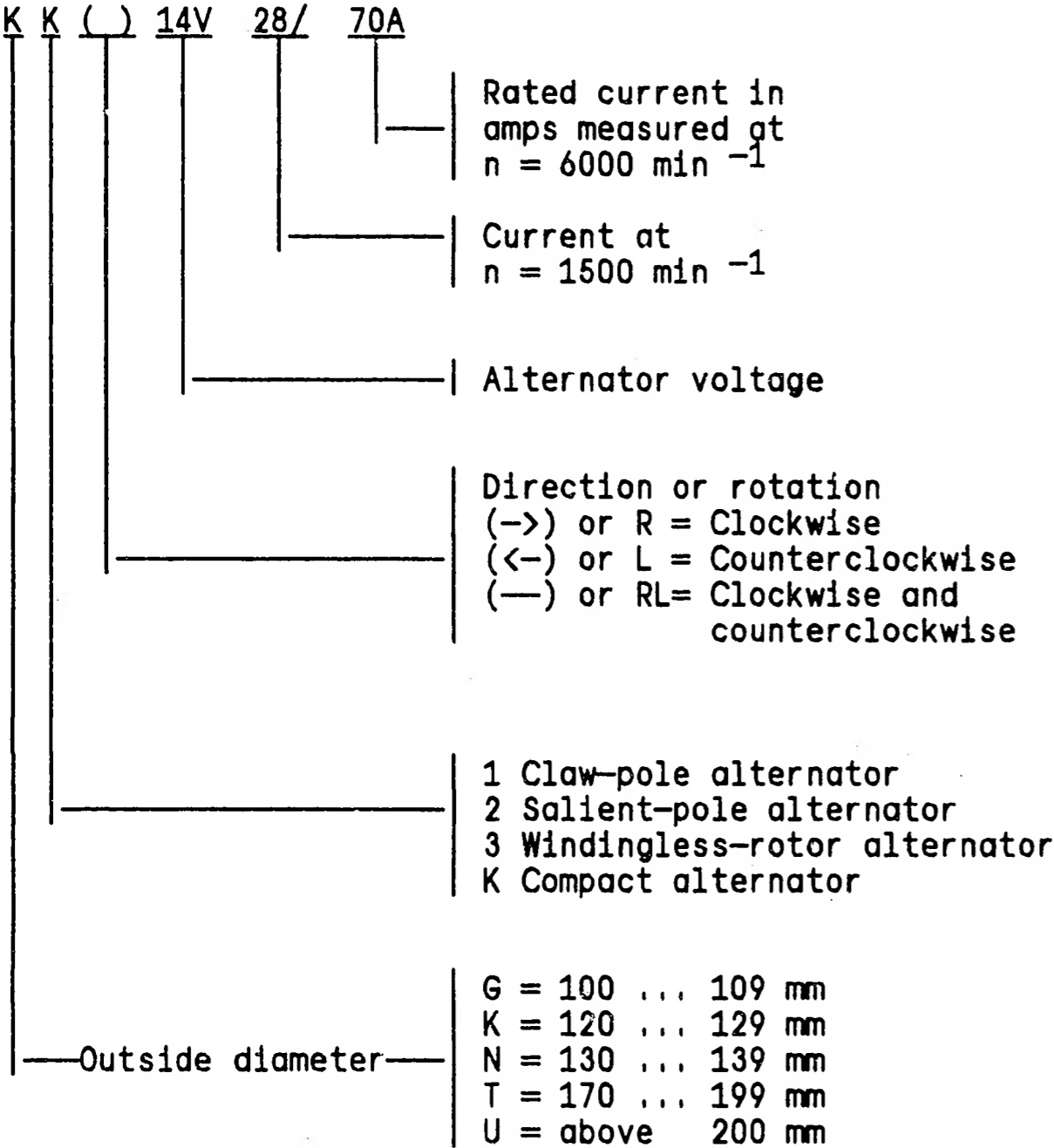
CIRCUIT DIAGRAM OF KK->14V ALTERNATOR

GENERAL INSTRUCTIONS

Explanation of type designation on alternator
(old designation) e.g.: K1()14 V 55 A 20



Explanation of type designation on alternator
(new designation as of early 1983)
e.g.: KK () 14 V 28/70 A



Cleaning the parts

CAUTION ! FIRE HAZARD

Alternators are being increasingly fitted with long-storage capacitors (e.g. for the interference suppression of receivers and transmitters).

When washing parts of the alternator, it is possible for the capacitor to discharge when immersed in cleaning fluids, there then being the danger that inflammable liquids will ignite. For this reason, parts with capacitors must only be washed in tri- or perchloroethylene.

Note :

Alternator 0 120 469 521 has been used for drawing up these repair instructions.

The different versions of these alternators must be taken from the relevant service-parts microcards.

TEST EQUIPMENT AND TOOLS

Test equipment

Alternator test bench	EFLJ 91	0 683 300 100
or	EFLJ 25..	0 680 110 ..
or	EFLJ 70 A	0 680 104 ..

Mounting plate
for mounting alternators
with swivel-arm mounting
to alternator test bench
EFLJ 25, 70

EFLJ 66/3

For additional testing:

Ignition oscilloscope (all versions)

or

Bosch Motortester (all versions)

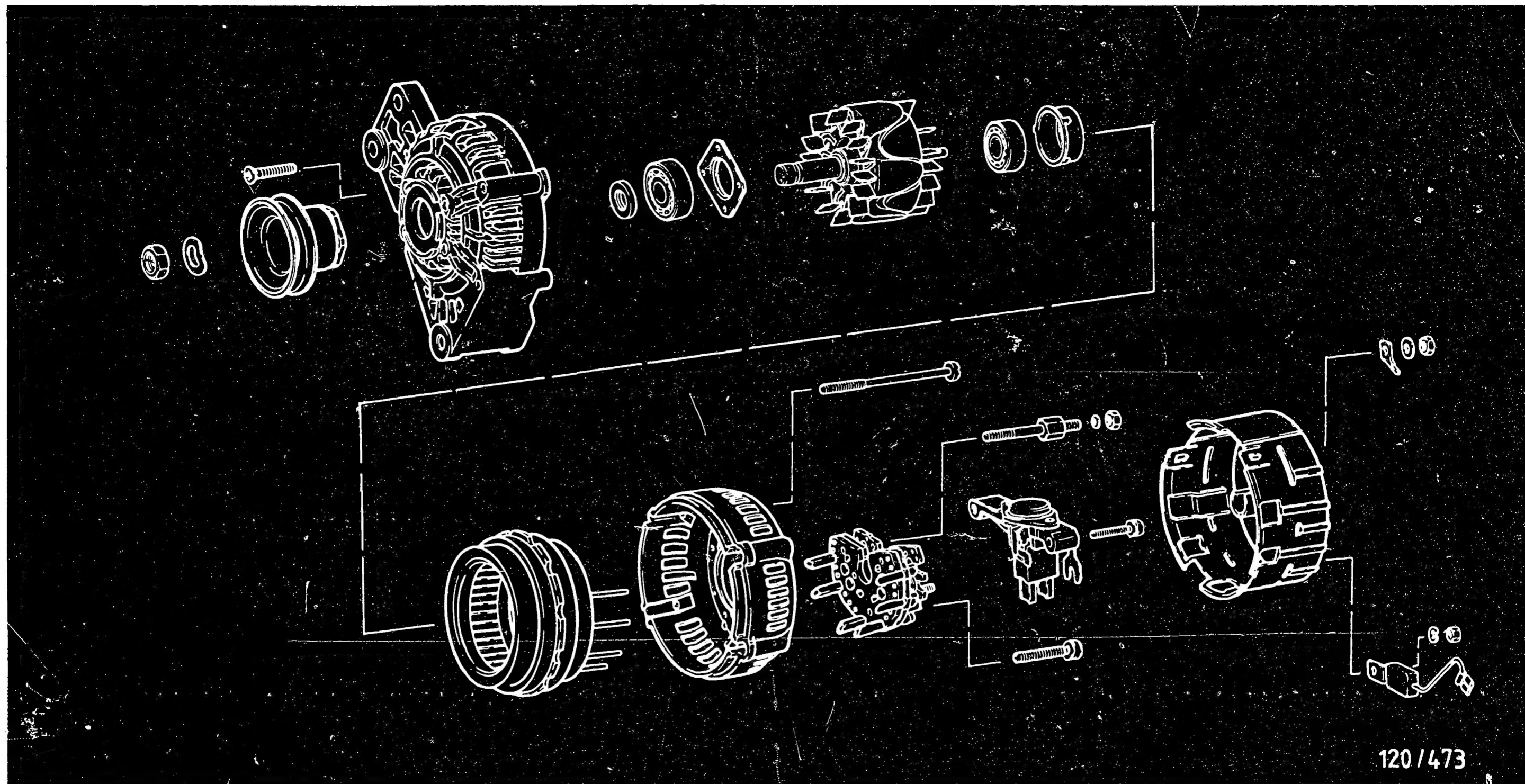
For production reasons:
continued on the following
coordinate.

TEST EQUIPMENT AND TOOLS (CONTINUED)

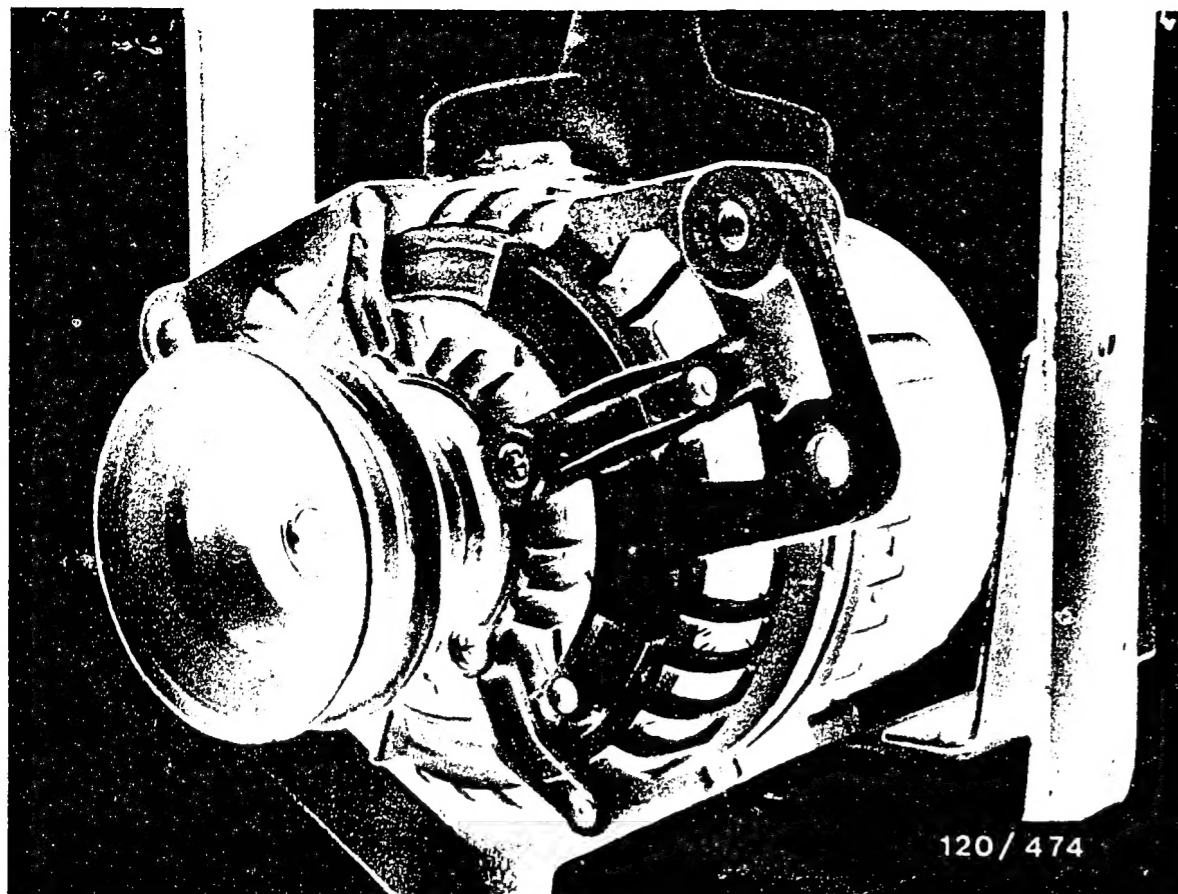
Test panel	or	EFAW 81 KDAW 9984	0 681 169 013
Transformer panel	or	EFAW 82 KDAW 9985	0 681 169 014
Insulation tester or test prods		EFAW 84 KDAW 9983	(included in scope of delivery of EFAW 81 / KDAW 9984)
Dial gauge		EFAW 7	1 687 233 011
Magnetic instrument stand		T-M 1 (EW/MS1 B1)	4 851 601 124 0 601 980 001
Alternator tester	or	EFAW 192 WPG 012.00	0 681 101 403 0 684 201 200
3 feeler gauges, 0.15...0.6 mm		KDZV 7399	
Electric tester		ETE 014.00	0 684 101 400

TEST EQUIPMENT AND TOOLS (CONTINUED)

Socket wrench for belt pulley 8 x 120 Allen key	KDLI 6030 Commercially available
Holding device for belt pulley	KDLI 6006
Clamping pin for arbor press	KDLI 6010
Pressing-on mandrel for collector-ring end shield	KDLI 6027
Pressing-on mandrel for drive end bearing	KDLI 6018
Protective sleeve for collector rings	KDLI 6032
Clamping support	KDAW 9999
Mandrel press	(commercially avail.)
Two vee blocks	(commercially avail.)



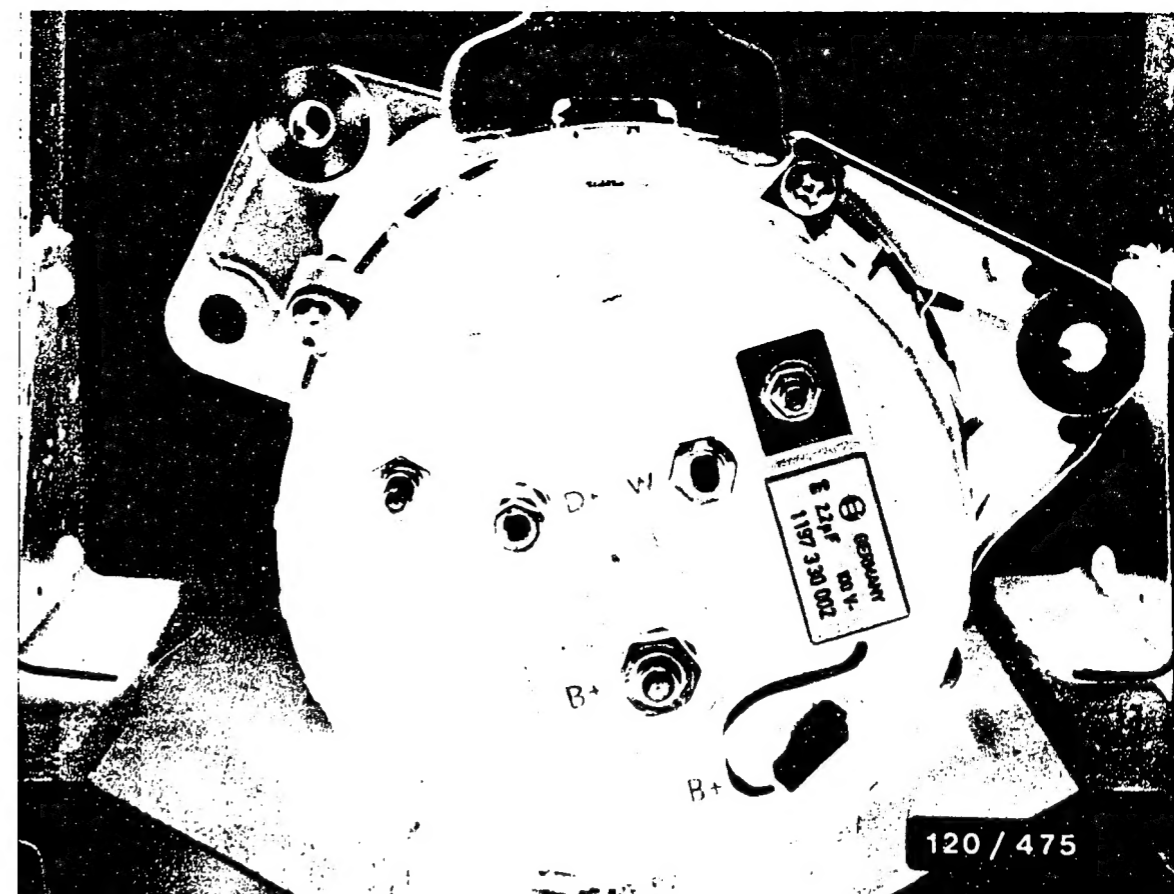
EXPLODED VIEW OF KK ALTERNATOR 0 120 485 ..



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DISMANTLING THE ALTERNATOR AND TESTING THE COMPONENTS

Clamp the alternator in clamping support KDAW 9999.



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Testing suppression capacitor

Disconnect suppression-capacitor lead from B+ plug connection.

Connect electric tester between suppression-capacitor lead and terminal B- of alternator.

Set value 1,8...2,8 micro-farad

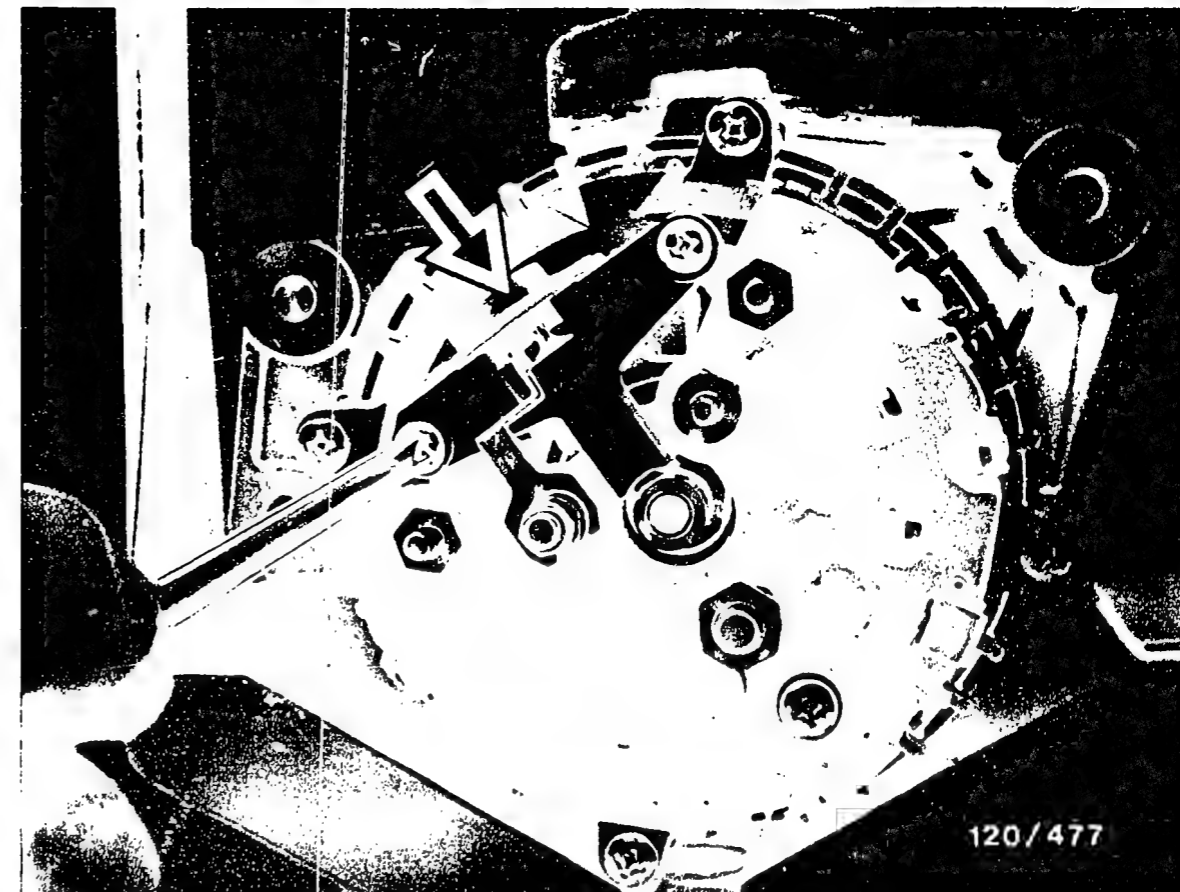
If set value is not reached replace defective suppression capacitor.

After testing, discharge suppression capacitor by short-circuiting to prevent igniting of cleaning fluid when cleaning the parts.



Remove protective cap

Slightly lift 3 engaging lugs (illustration, arrow, only 1 visible) of protective cap on alternator and remove protective cap.



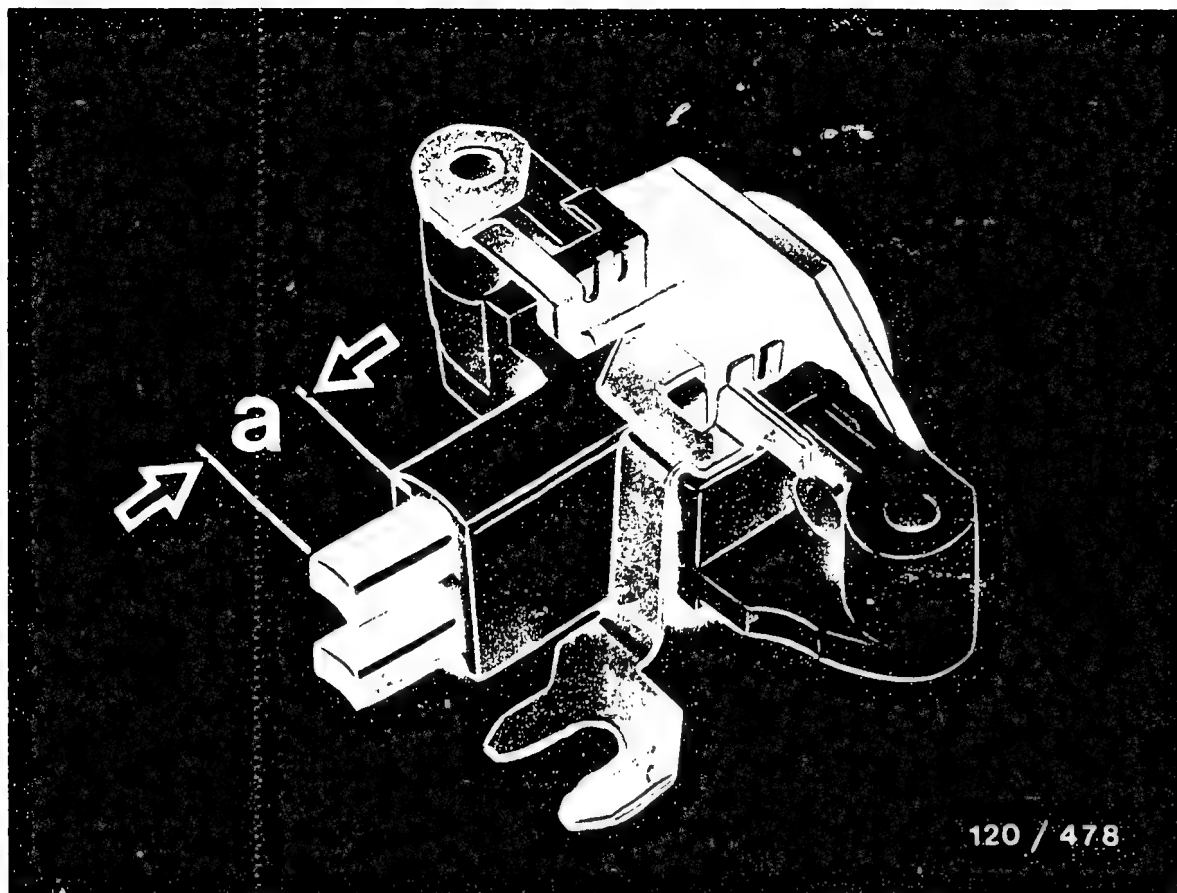
Arrow = Electronic voltage regulator
with brush holder

N o t e :

Remove the electronic voltage regulator prior to disassembly of the alternator.

To do this, unscrew the two fastening screws of the voltage regulator and disconnect the D+ bar of the regulator from the D+ pin.

If the disassembly sequence is not observed, the carbon brushes may break off when the alternator is pulled apart.



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Testing the regulator for external damage and replacing the carbon brushes

If the carbon brushes are broken off or if dimension "a" is less than 5 mm, replace the carbon brushes.

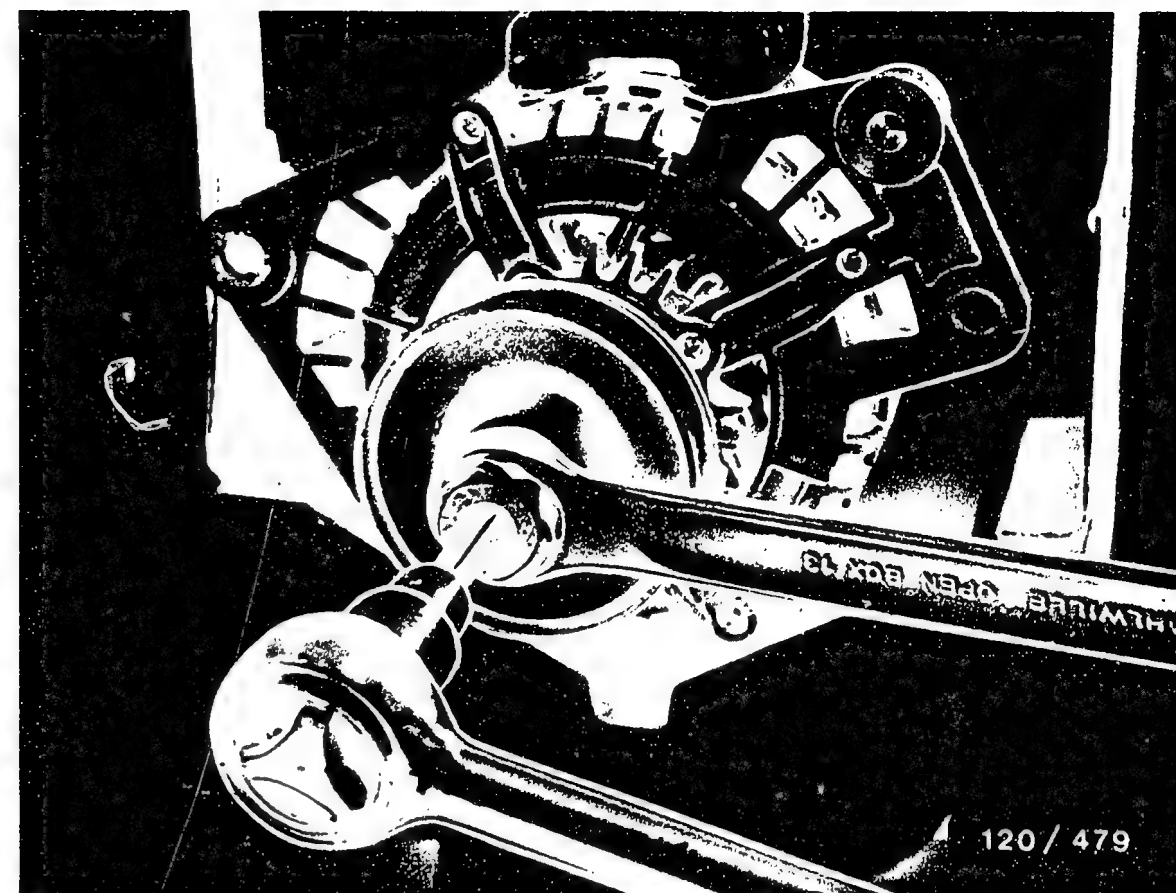
When soldering in the new carbon brushes, make sure that dimension "a" is kept to.

Carbon-brush projections, new 10...11 mm

Minimum projection of brush 5 mm

N o t e :

Solder (colophonium tin only) must not flow into copper strand.
After fitting, check the carbon brushes for freedom of movement.



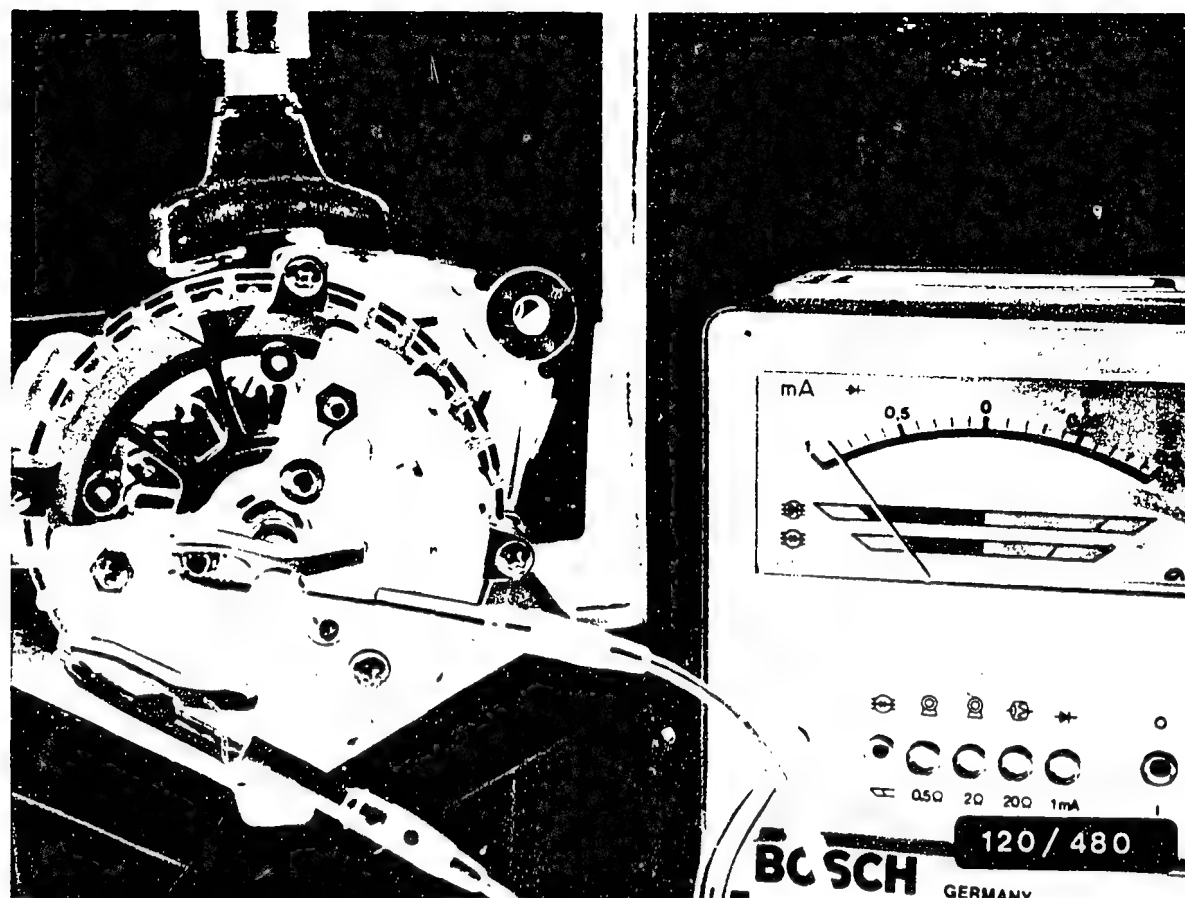
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REMOVING BELT PULLEY

Place socket wrench KDLI 6030 on fastening nut of belt pulley.

Using a commercially available Allen key (8 x 120 mm), hold the rotor shaft of the alternator and loosen nut with socket wrench (A/F 22).

Remove belt pulley.



Testing rectifier

Test the rectifier for proper functioning in connected condition using EFAW 192 or WPG 012.00.

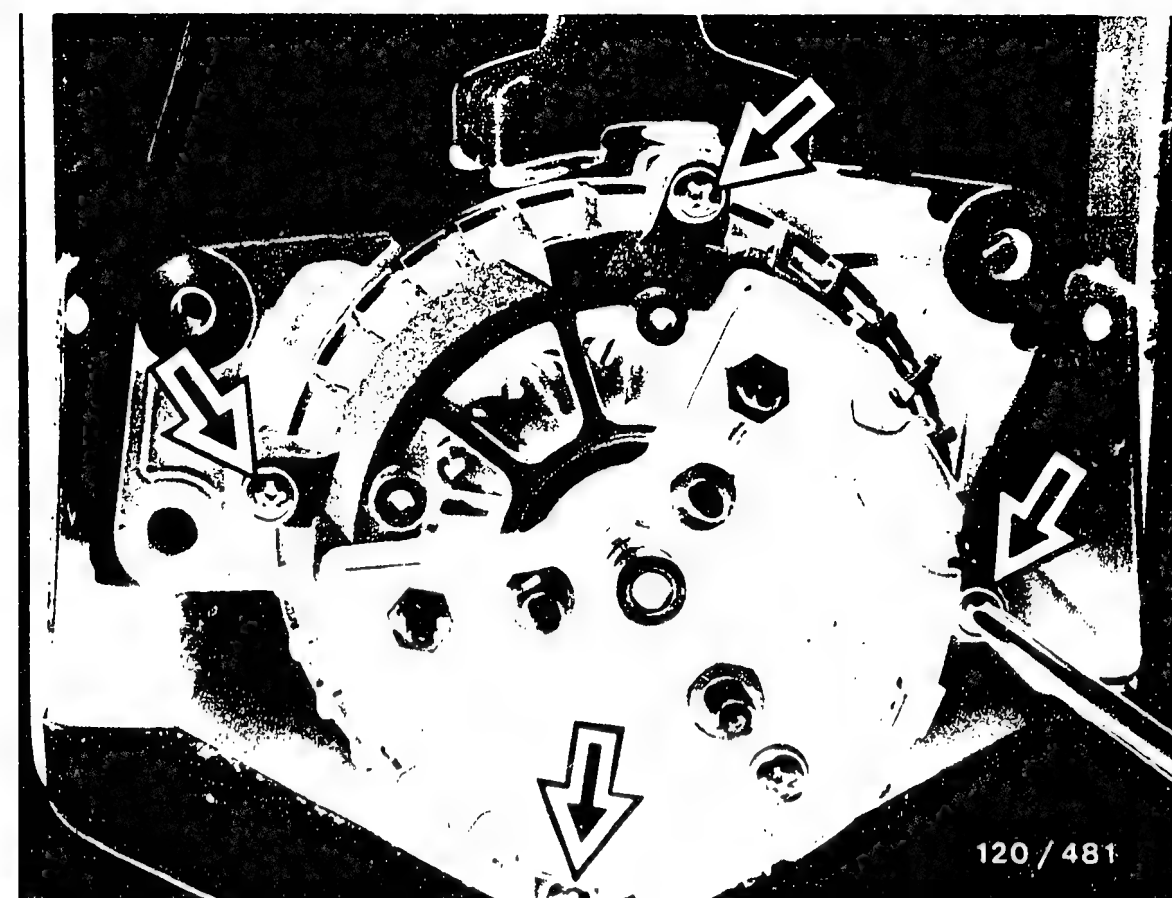
Capacitor not connected.

Observe switch position on tester.

Test points: Housing and winding ends
B+ and winding ends
D+ and winding ends

The rectifier is O.K. if the tester needle is in the green area of the scale in these measurements.

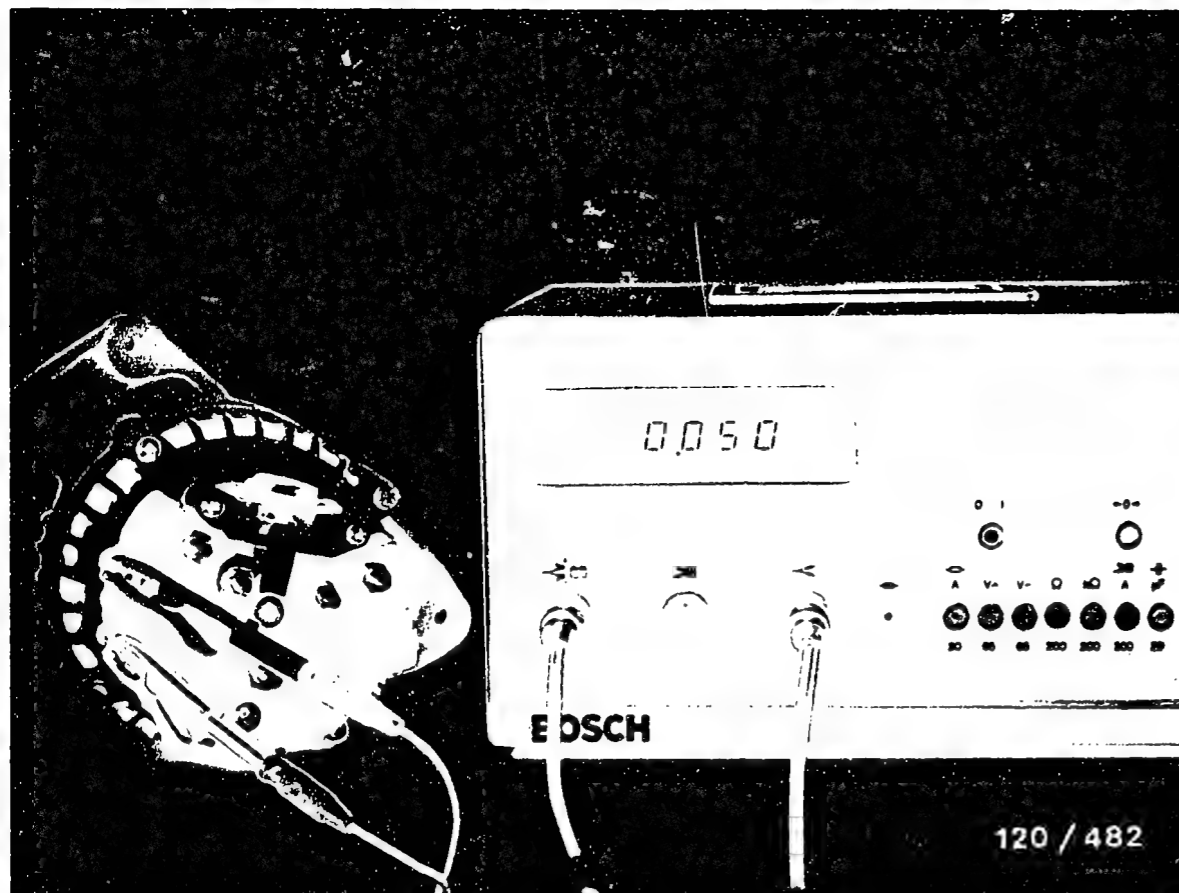
If one or more diodes is defective, the rectifier must be replaced complete with stator and end shield.



Note :

Before the alternator is further dismantled, mark the drive-end-bearing housing, collector-ring end shield and stator so that these parts are brought into the same position again when assembling.

Loosen four fillister-head screws (arrows) and remove. Withdraw drive-end-bearing housing with rotor from collector-ring end shield.

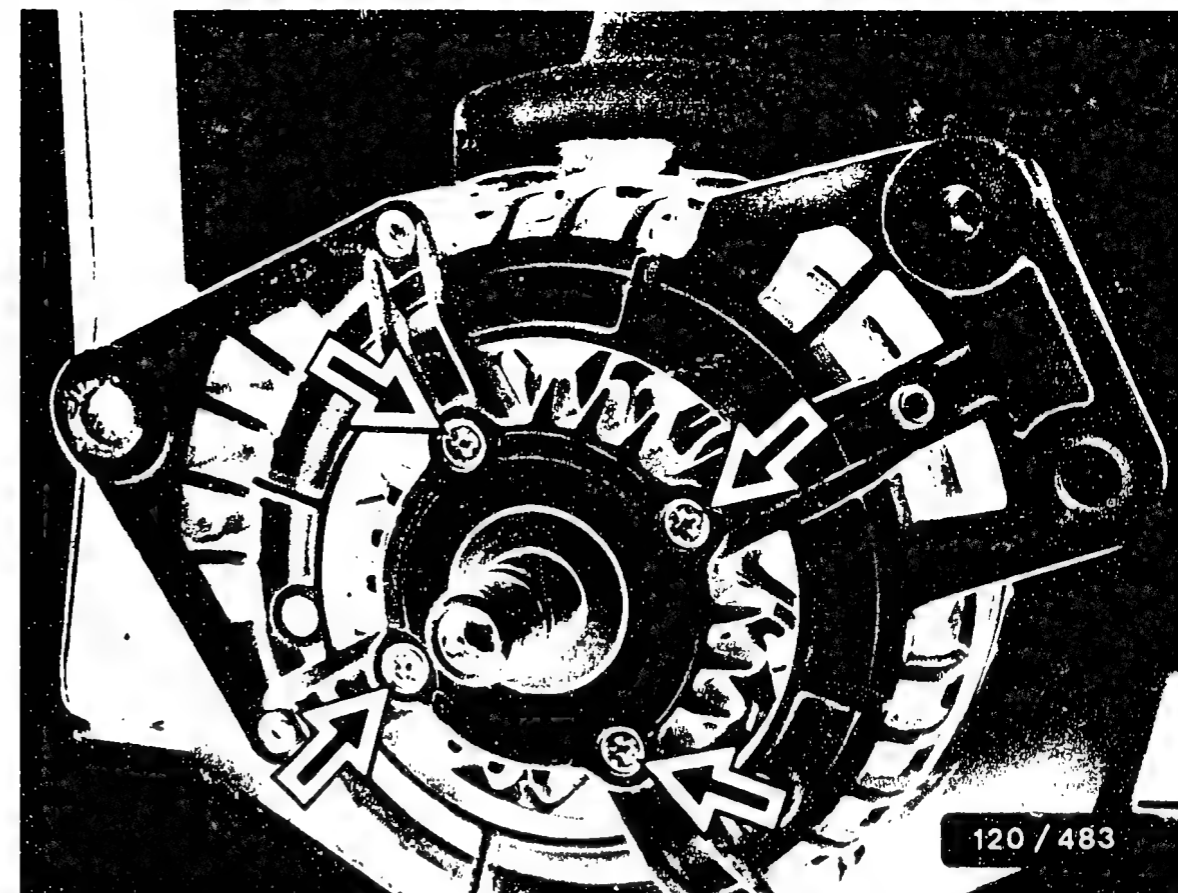


Testing stator (resistance)

Test resistance of stator in installed condition (illustration).

Observe the tester switch position.
Measure resistance between the phase outputs on alternator:

Designation	Ω + 10%
KK(->)14V28/70A	< 0.1



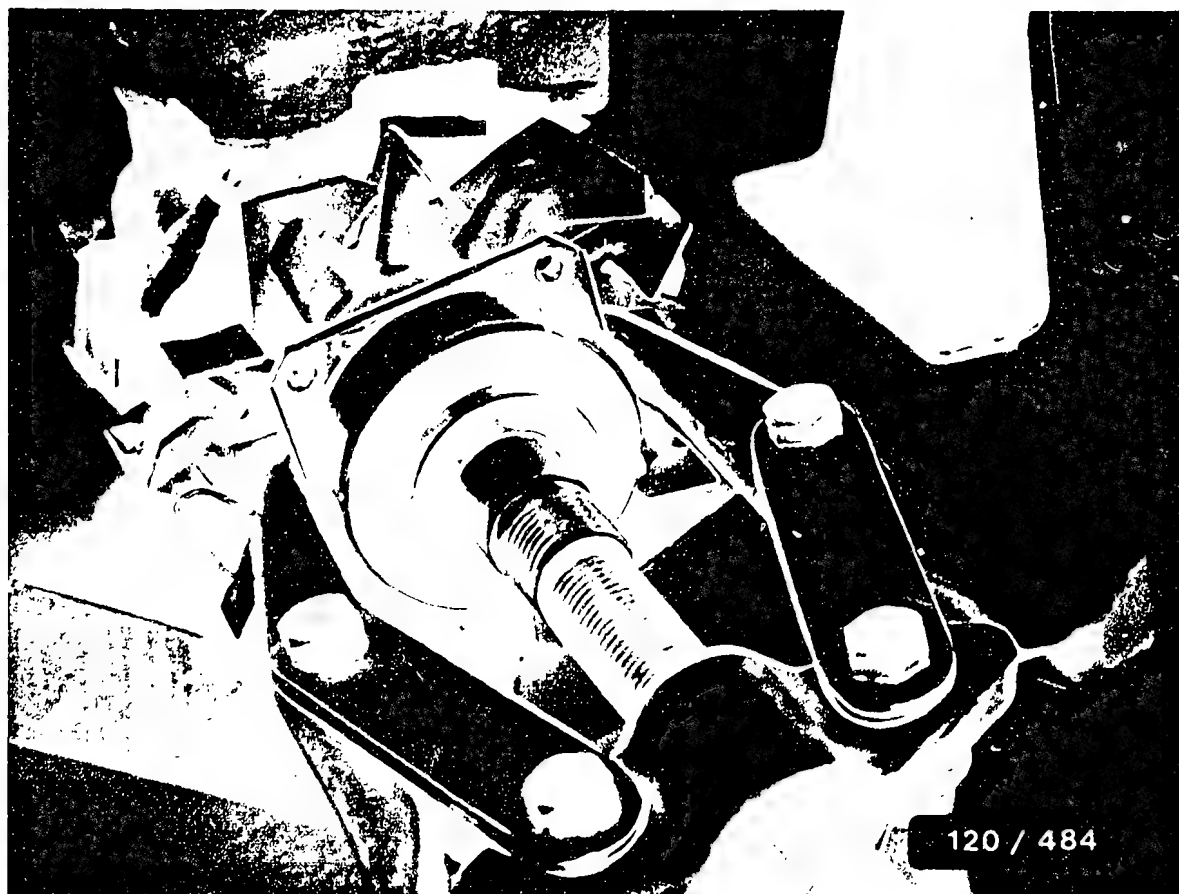
Removing the claw-pole rotor

The claw-pole rotor need only be removed, if the following components are defective:

Collector rings, excitation winding or deep-groove ball bearing.

Loosen 4 fastening screws and remove (see illustration).

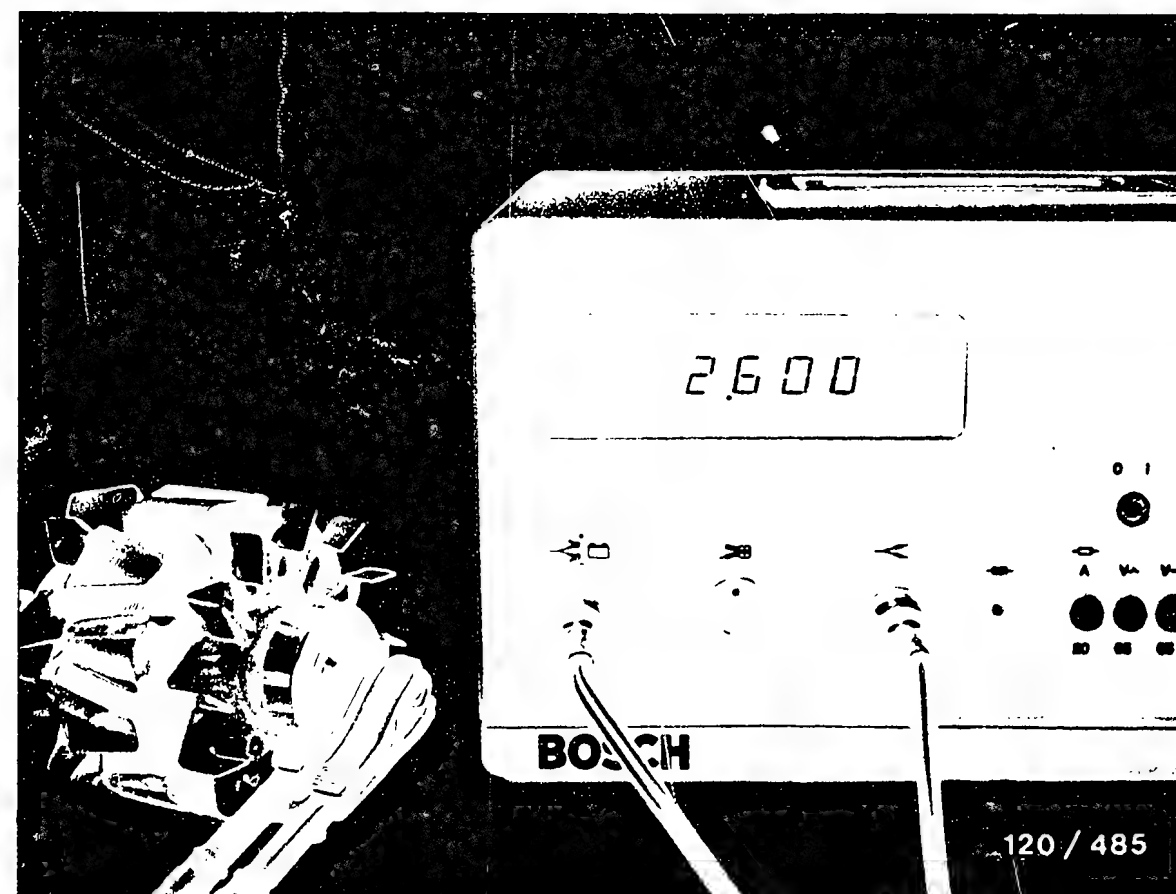
Pull deep-groove ball bearing with rotor out of end shield (sliding fit).



Clamp claw-pole rotor in clamping support.

Using a commercially available puller, pull the deep-groove ball bearing with holder plate from the drive side (refer to illustration).

Turn claw-pole rotor in clamping support. Place protective sleeve KDLI 6032 over collector rings. Using commercially available puller, pull off deep-groove ball bearing on collector-ring side (not illustrated).

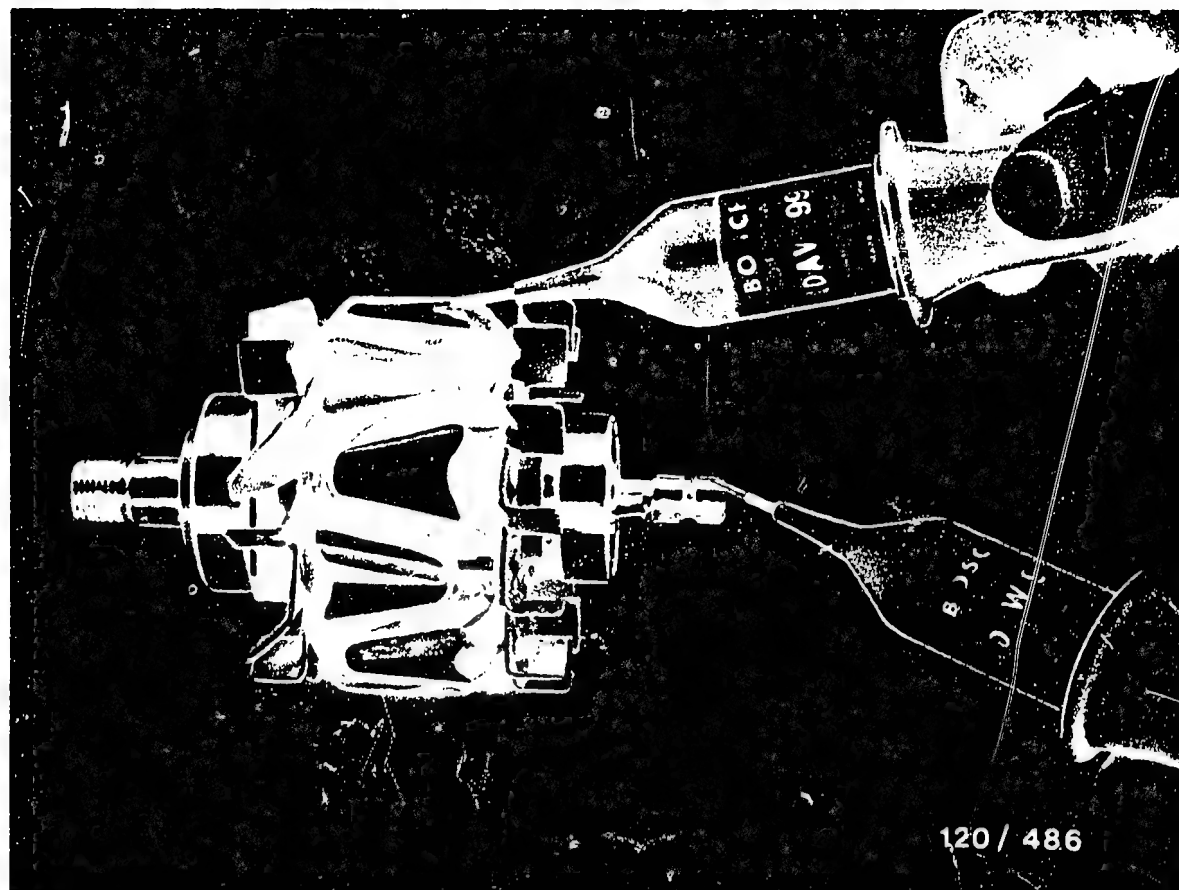


Testing rotor resistance

Measure rotor resistance using electric tester ETE 014.00 (illustration).

Resistance with alternator

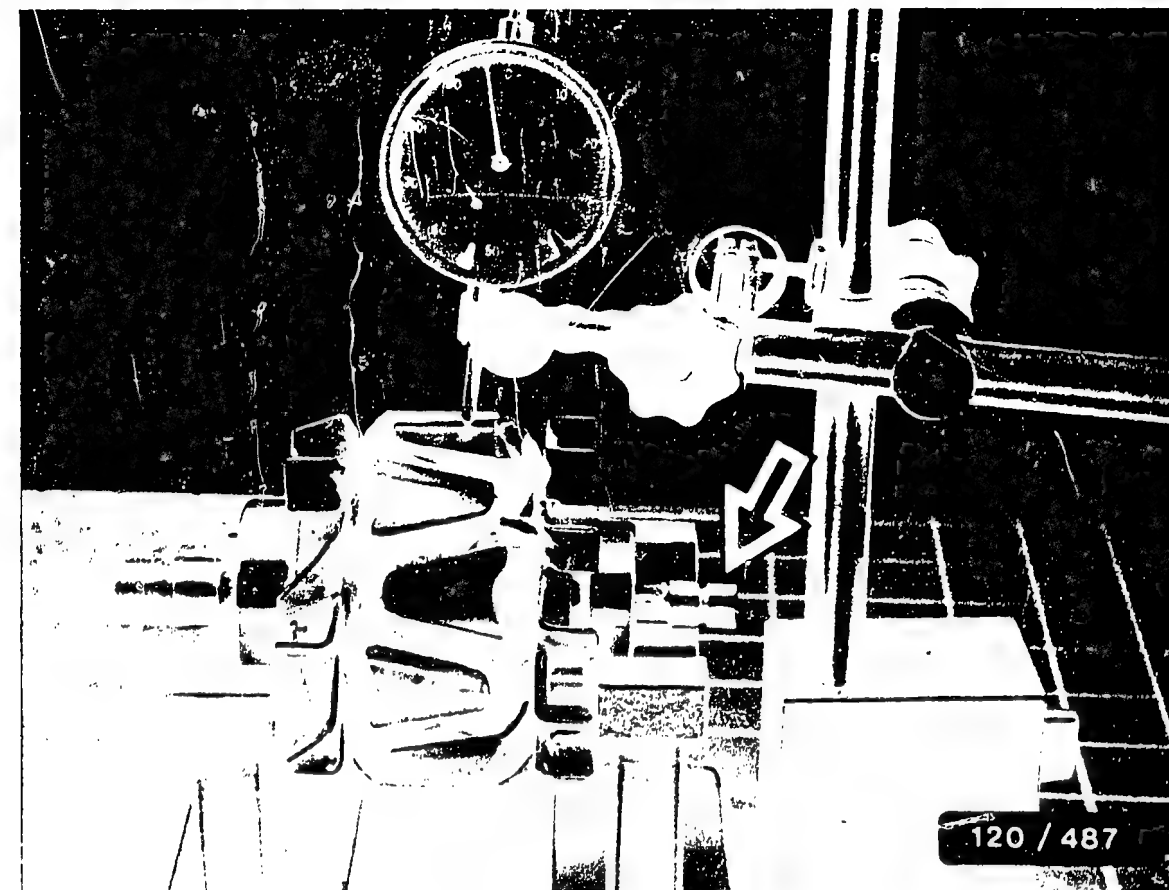
Designation	Ω + 10%
KK(->)14V28/70A	2.6



Testing the rotor for short circuit to ground

Test the rotor for short circuit to ground using test prods EFAW 84 or KDAW 9983.

Test voltage 40 V AC.



Measuring concentricity

Support rotor at bearing points in vee-blocks, positioned exactly horizontally. Carry out concentricity measurement on external diameter of rotor and external diameter of collector rings (see arrow) using magnetic instrument stand T-M 1 (4 851 601 124) and dial gauge EFAW 7.

Maximum deviation of the collector rings may be 0.03 mm. In case of greater deviation, replace rotor and collector rings.

Minimum diameter of collector rings 10,5 mm

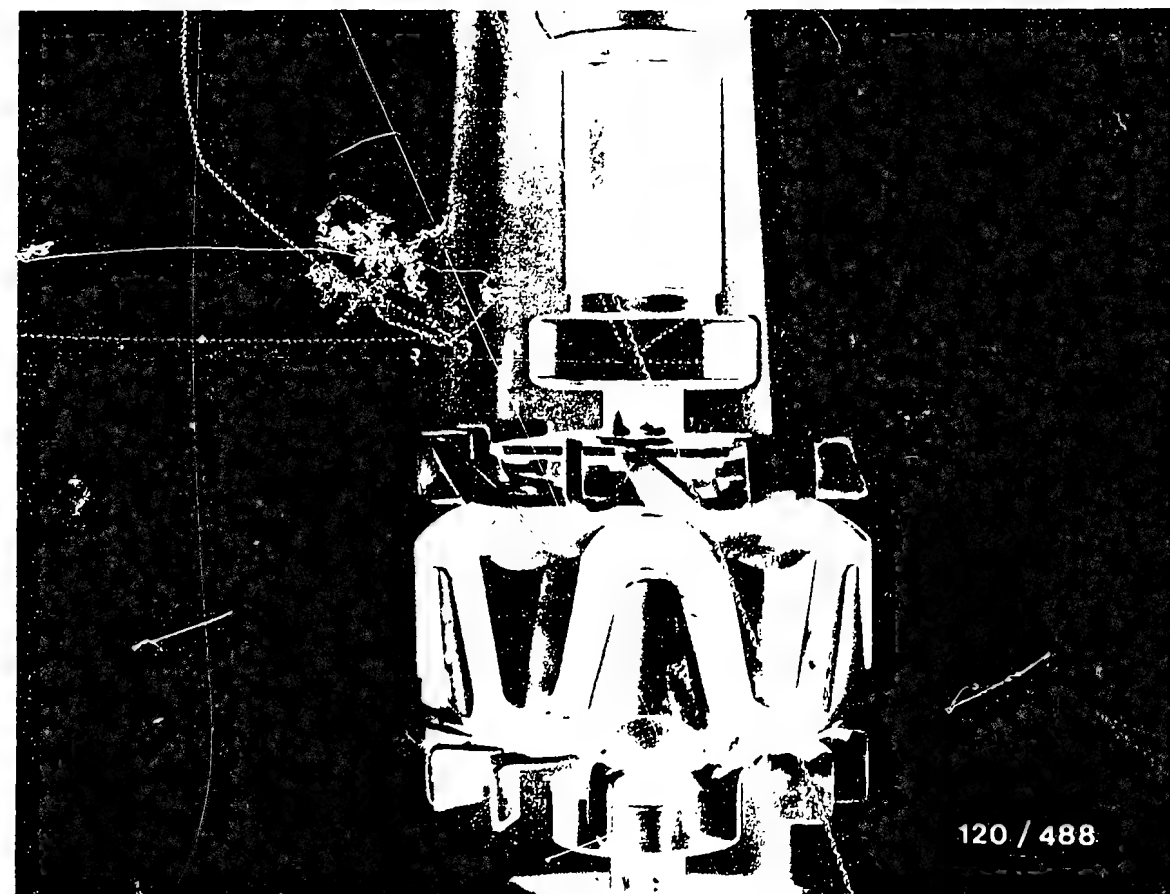
CLEANING THE PARTS

CAUTION ! FIRE HAZARD

Alternators are being increasingly fitted with long-storage capacitors (e.g. for the interference suppression of receivers and transmitters).

When washing components of the alternator, it is possible for the capacitor to discharge when immersed in cleaning fluids, there then being the danger that inflammable liquids will ignite.

For this reason, components with capacitors must only be washed in tri- or perchloroethylene.

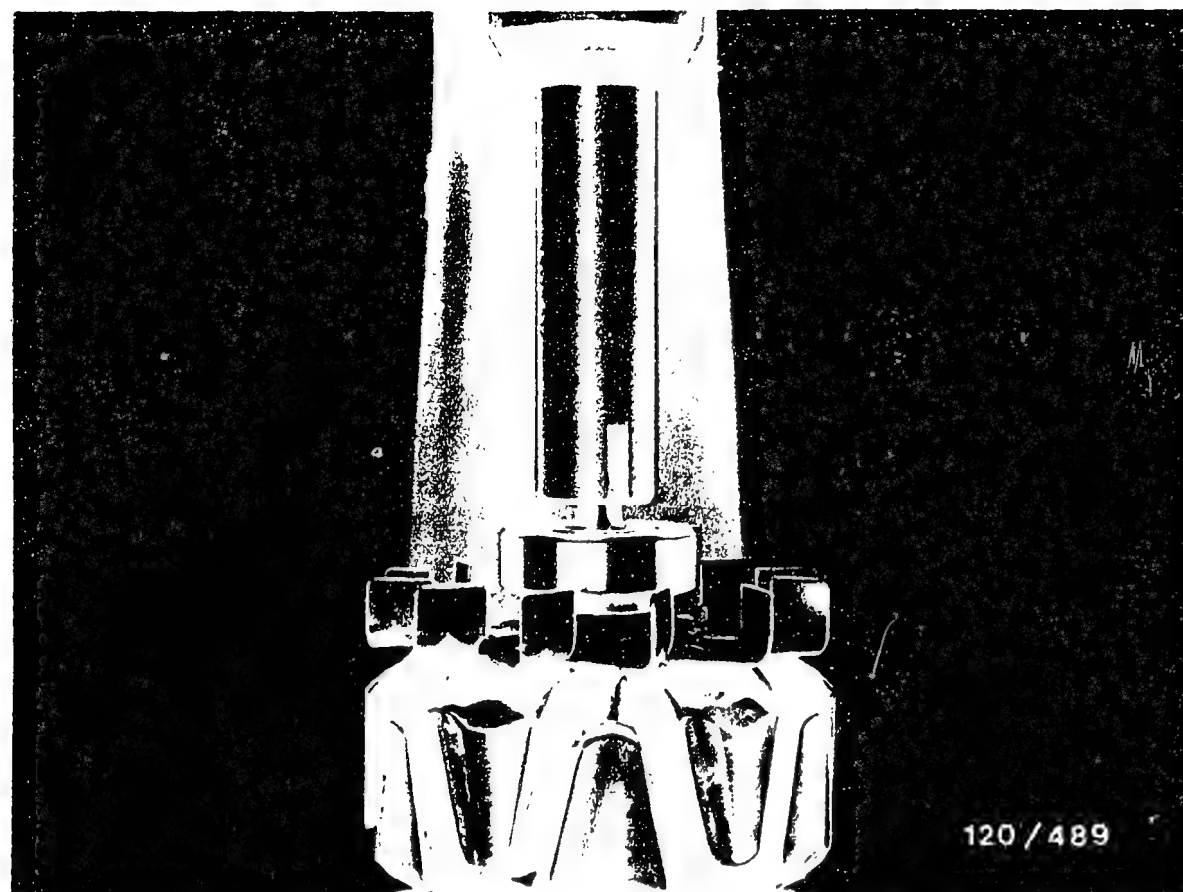


ASSEMBLING ALTERNATOR

Press deep-groove ball bearings onto rotor shaft on drive side.

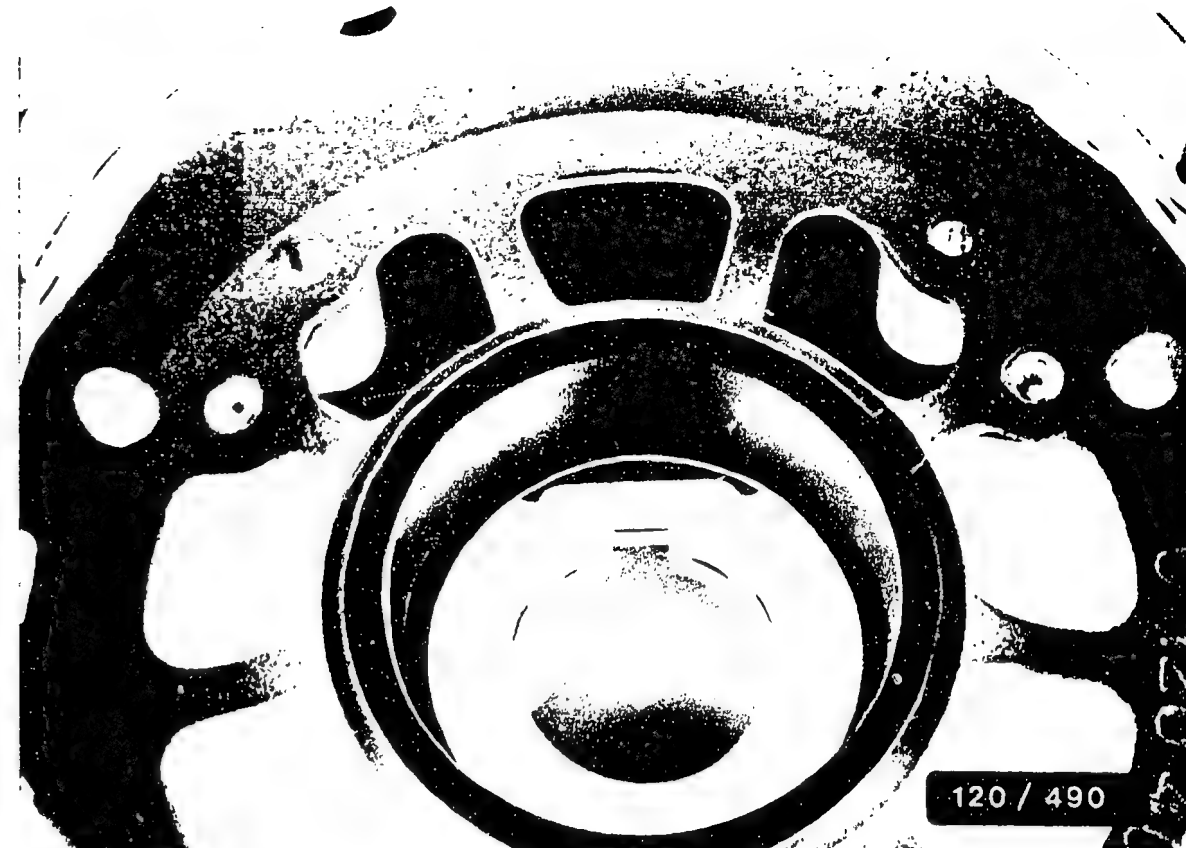
Push protective sleeve KDLI 6032 over collector rings. Set rotor on protective sleeve and place holding plate on rotor shaft on drive side true to side.

Using pressing-on tool KDLI 6018, press the deep-groove ball bearing and thrust ring (turn-outside on inside) one after the other down to stop as shown in the illustration.



Pressing deep-groove ball bearing on collector-ring side

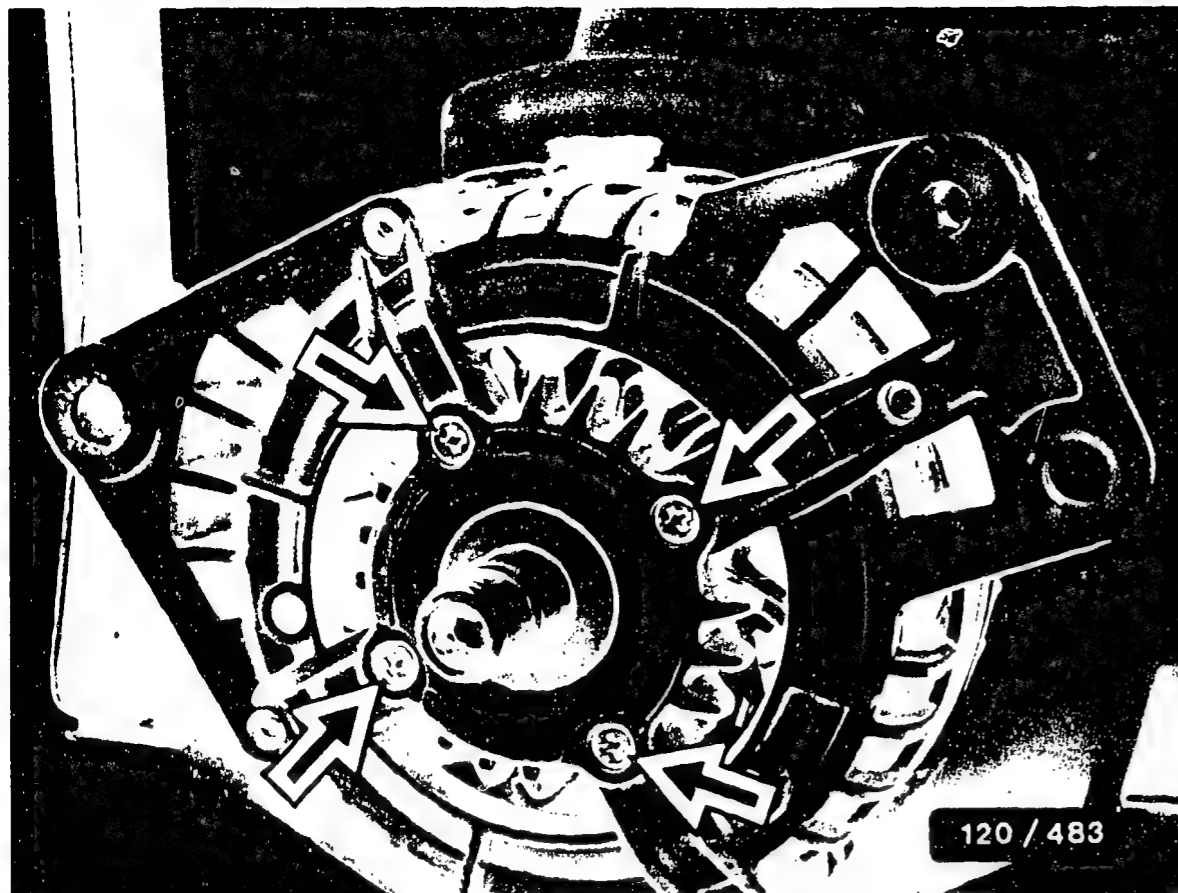
Using pressing-on tool KDLI 6027, carefully press the deep-groove ball bearing on the collector-ring side far enough so that the inner race of the ball bearing is flush with the enlargement of the rotor shaft after the collector rings (see illustration). Do not damage the wiring of the rotor winding.



Replacing the plastic bushing

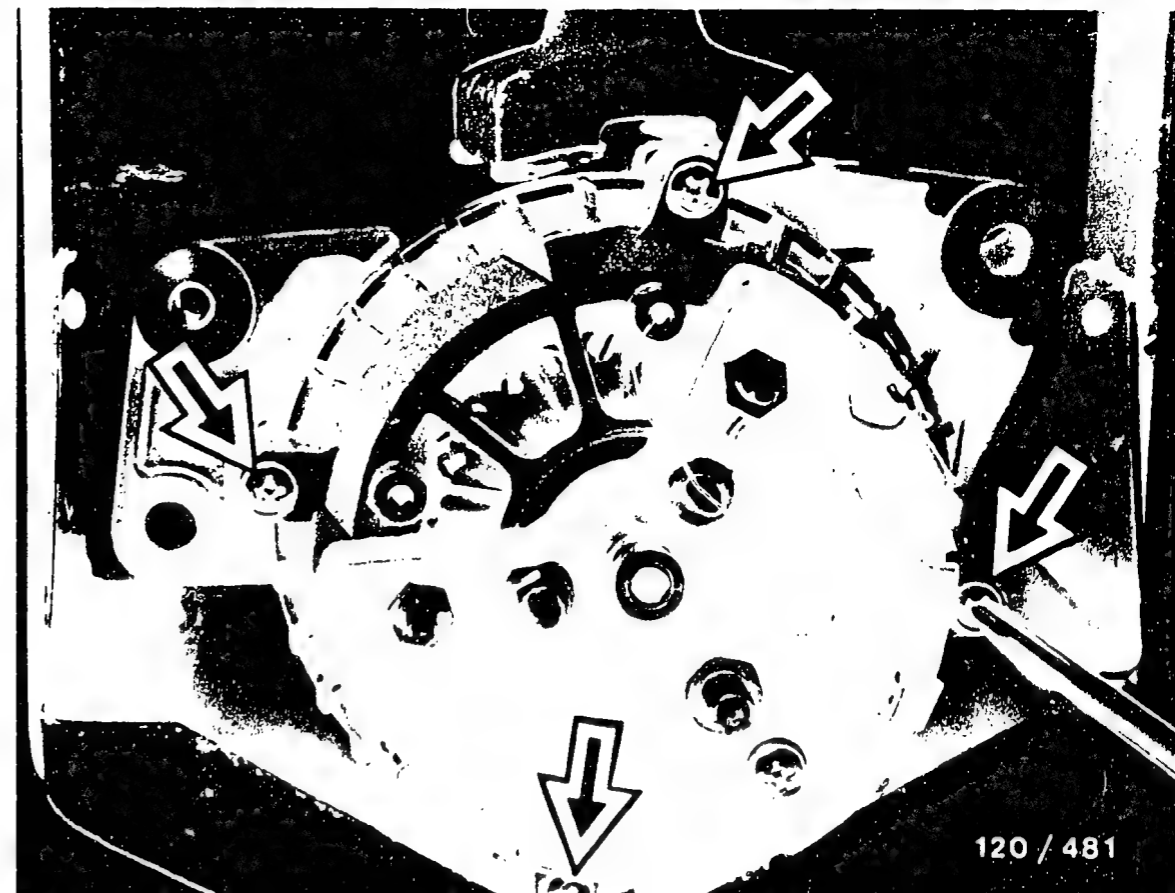
Check the plastic bushing in the collector-ring end shield for damage.

If necessary, replace with new plastic bushing.



Installing rotor in drive end bearing

Guide deep-groove ball bearing with rotor into drive end bearing and fasten holding plate from outside of end shield.
First position 4 fastening screws (arrows) and then tighten to a torque of 2,7...3,5 Nm crosswise.

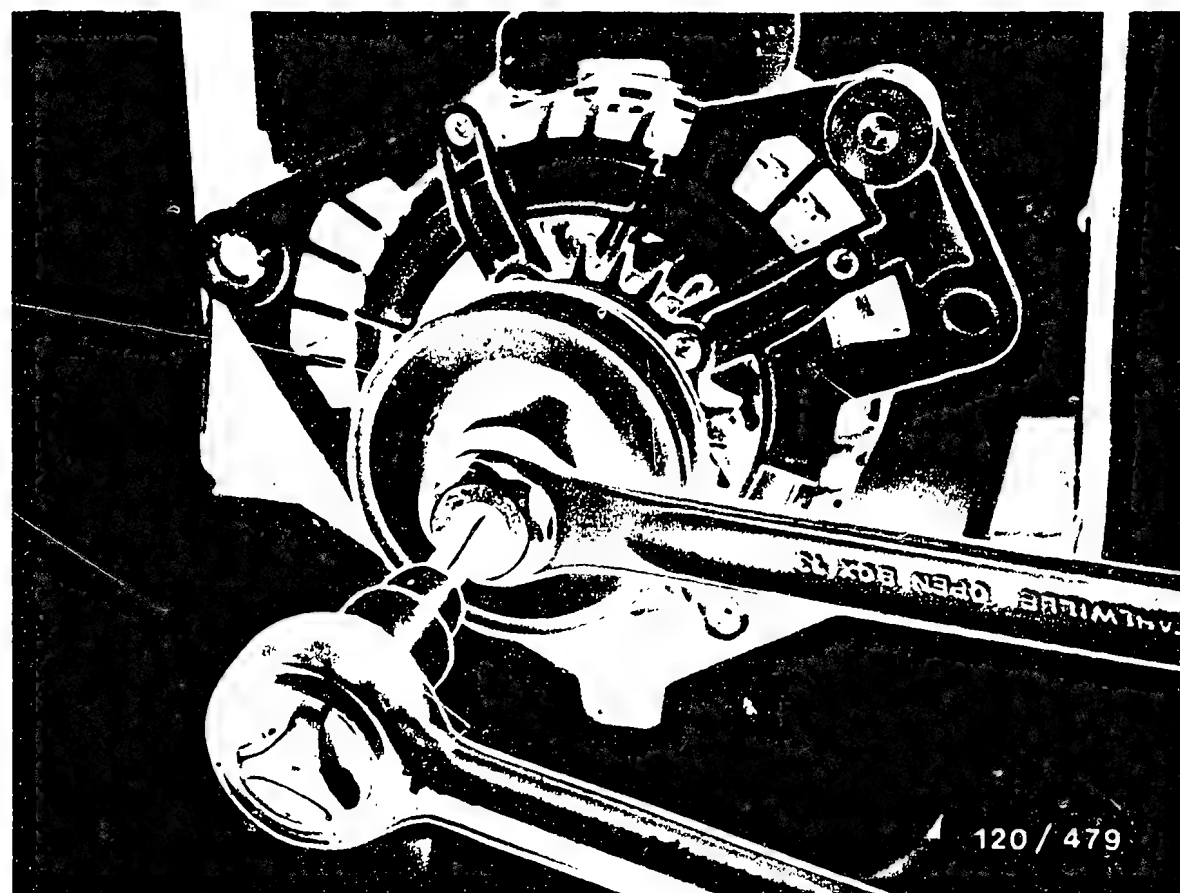


Assembling drive end bearing with rotor and collector-ring end shield with stator

Carefully guide in rotor with drive end bearing.

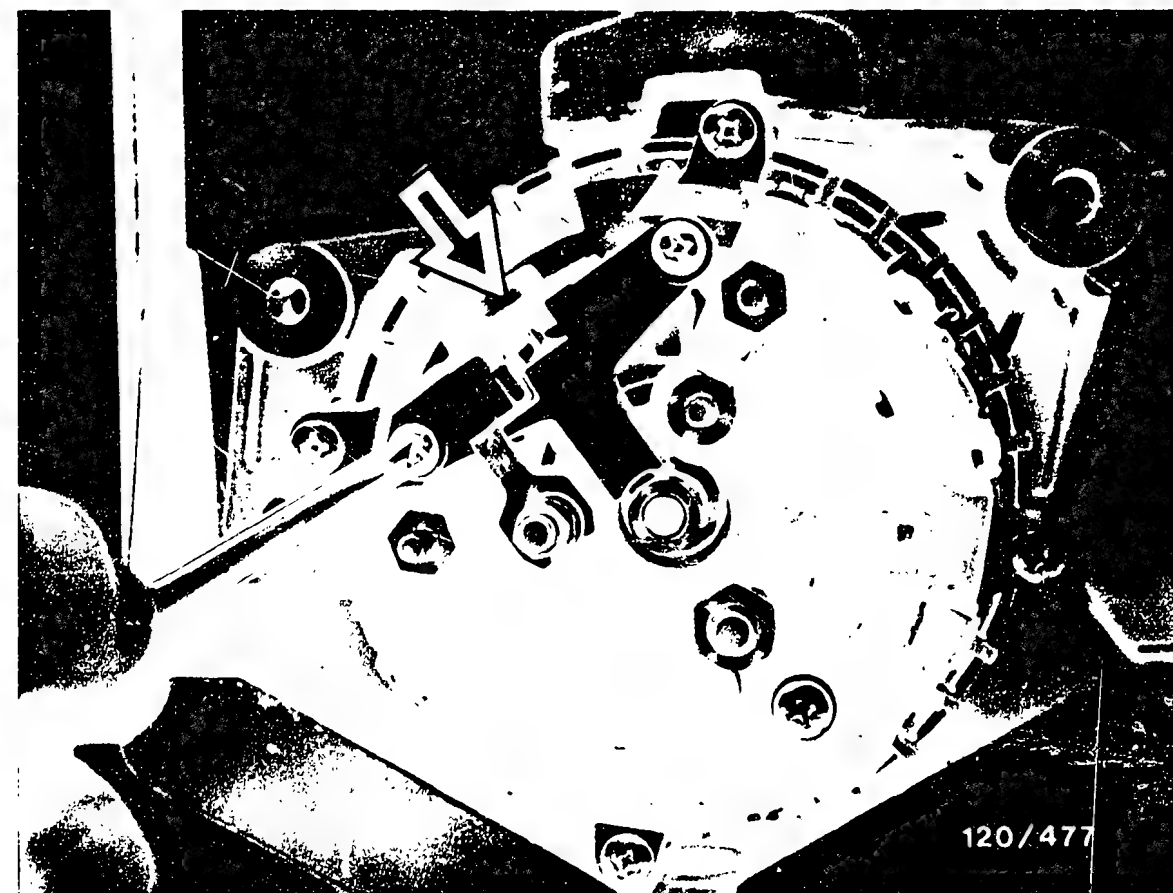
Bring the markings made before disassembling the alternator on the collector-ring end shield and drive end bearing into alignment.

Using a screwdriver, first lightly drive in the 4 fastening screws (arrows), then tighten to a torque of 2,7...3,5 Nm crosswise.



Mounting belt pulley (Allen head in rotor shaft)

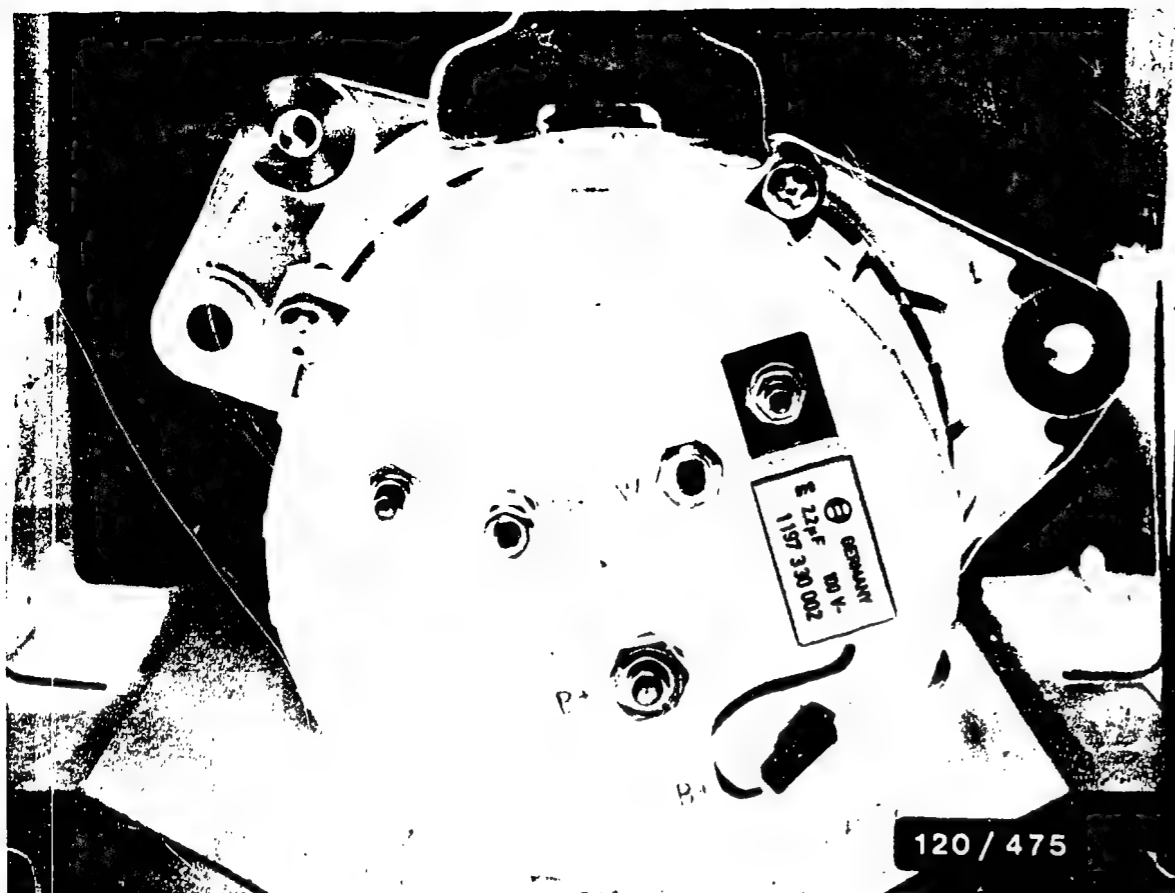
Place belt pulley on rotor shaft true to side. Using 8x120 Allen key, hold rotor. Place socket wrench KDLJ 6030 on nut and tighten the belt pulley using a box wrench, A/F 22. Tightening torque 45...55 Nm



Installing voltage regulator

Place voltage regulator on collector-ring end shield and screw on with 2 fastening screws.

Tightening torque for
mounting voltage regulator 1,6...2,3 Nm
D + fastening 3,2...4,0 Nm



Mounting protective cap and capacitor

Clip protective cap onto collector-ring end shield.

Fasten capacitor and tighten nut to 3,2...4,0 Nm.

Plug capacitor plug connector to B+ plug connection.

TESTING ALTERNATOR WITH VOLTAGE REGULATOR ON TEST BENCH

Test equipment and devices

Alternator test bench		EFLI 91	0 683 300 100
	or	EFLJ 25..	0 680 110 ...
	or	EFLJ 70A	0 680 104 ...

Mounting plate for mounting alternators with swivel-arm mounting on alternator test bench

EFLJ 66/3

EFLJ 25, 70

Alternator tester

WPG 012.00 0 681 101 403

For additional testing:

Ignition oscilloscope (all versions)

or

Bosch Motortester (all versions)

Mounting on the test bench

Swivel-arm-mounted or flange-mounted alternators must only be mounted on the test bench using the appropriate clamping fixture.

So that the power of the test-bench motor is sufficient, test using only the appropriate fan and pulley.

In addition, select the correct transmission ratio.

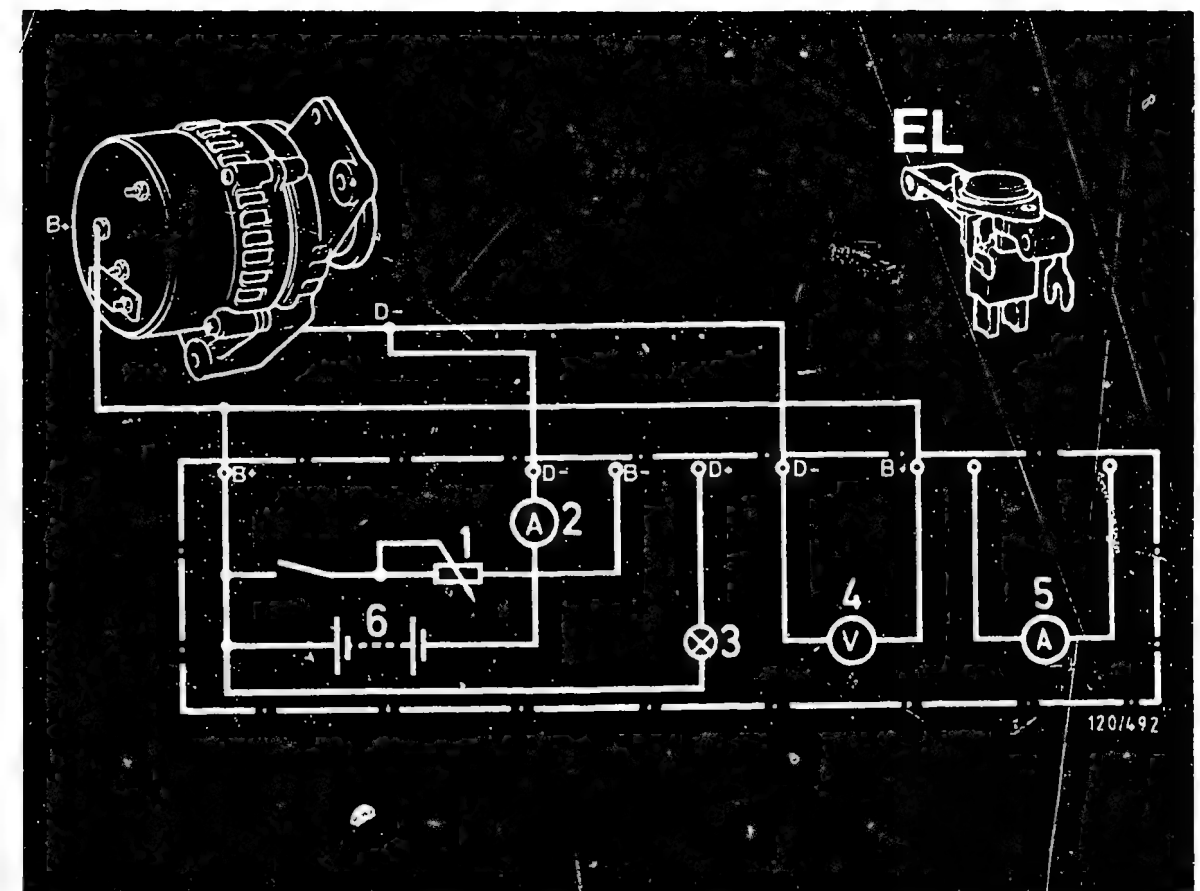
For test bench EFLJ 25..
the transmission ratio is 0.3 : 1.
This means: if the alternator pulley has, for example, a diameter of 100 mm, use test-bench pulley of 350 mm diameter.

For test bench EFLJ 70 A
the transmission ratio is 0.4 : 1.
This means: if the generator pulley has, for example, a diameter of 100 mm, use test-bench pulley of 250 mm diameter.

Note :

If, at very high alternator outputs, the drive power of the test-bench motor is not sufficient, then carry out the test only to the extent that the test speed does not drop at the required test current.

The charge indicator lamp must be completely out when power-testing.



- 1 = Loading resistor
- 2 = Ammeter
- 3 = Indicator lamp
- 4 = Voltmeter (regulated voltage)
- 5 = Ammeter
- 6 = Test-bench battery

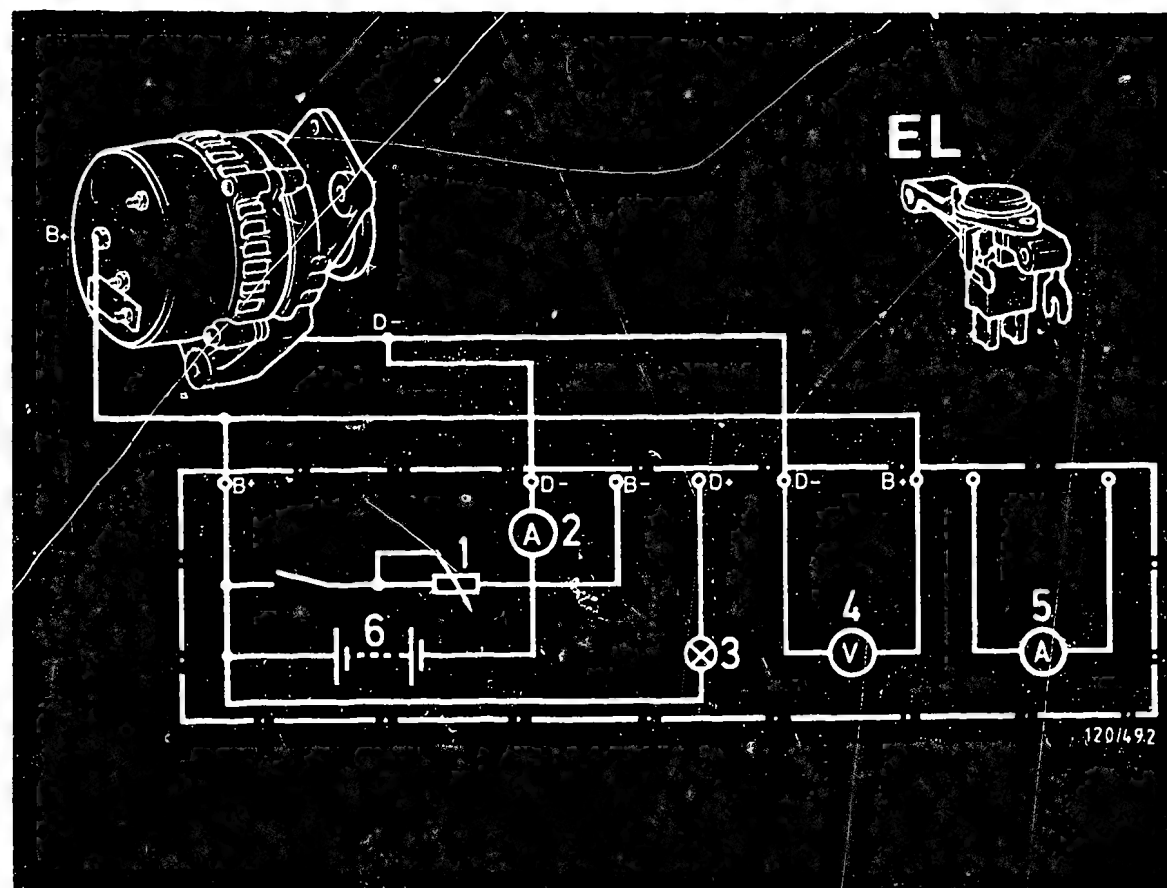
Connecting the alternator to the test bench

Connect the positive battery cable of the test bench to B+ of the alternator.

If the clamping table on the test bench is used as a ground cable, make sure that there are no contact resistances.

It is therefore advisable in the case of high-power alternators to connect the negative battery cable of the test bench directly to the alternator.

Connect voltmeter between B+ and B-.



- 1 = Loading resistor
- 2 = Ammeter
- 3 = Indicator lamp
- 4 = Voltmeter (regulated voltage)
- 5 = Ammeter
- 6 = Test-bench battery

Important:

All connections on the test bench must be properly connected.
When the alternator is running, the connection between alternator and battery must not be disconnected since, otherwise, the semiconductors in the alternator and regulator may be destroyed.

Do not operate the alternator without the battery being connected.

If a direction of rotation is marked on the fan wheel or on the alternator, then the alternator must only be driven in this direction of rotation.

Performance testing

Note:

In performance testing make sure that the blocking resistor built into the test bench is not connected to the circuit, since otherwise the charge indicator lamp will light up and mimic a fault in the alternator.

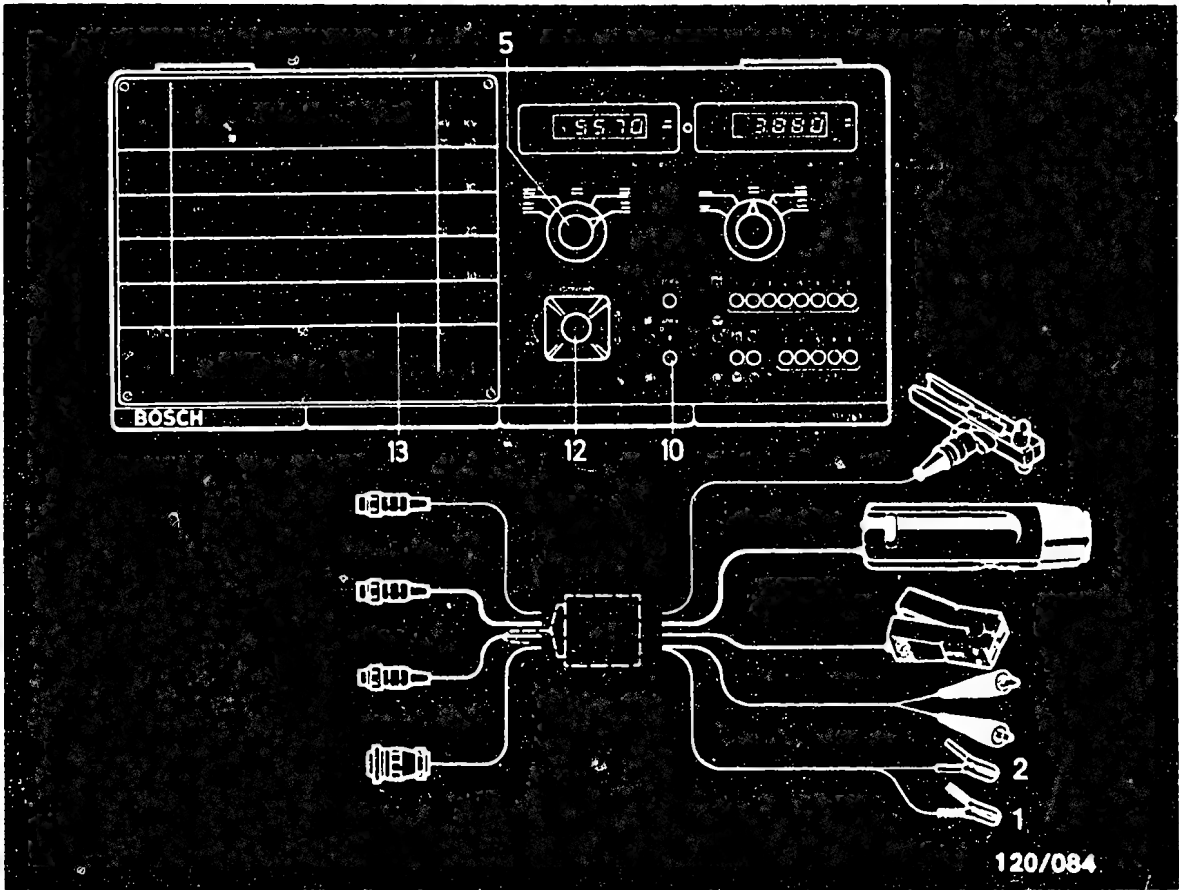
- * Note the direction of rotation of the alternator. The arrow for direction of rotation is shown on the protective cap.
- * The protective cap must be mounted on the alternator, as otherwise the alternator will be ruined through overheating.
- * Set the control voltage of the voltage regulator to 13 V for testing alternator with voltage regulator.
- * Let alternator run on the test bench at a speed of 6000 min^{-1} for 15 minutes. The alternator must be at operating temperature (approx. 60°C) for testing.

Alternators	Performance testing with volt. regulator		Resistance Ω + 10% Stator	Rotor
	min^{-1}	(A)		
0 120 485 ...				
KK(->)14V28/70A	1500 6000	28 70	< 0.1	2.6

Testing control voltage

Load current < 10A

Voltage-regulator part number	Type designation	Control voltage V
1 197 311 210	EL 14 V..	13.7...14.5

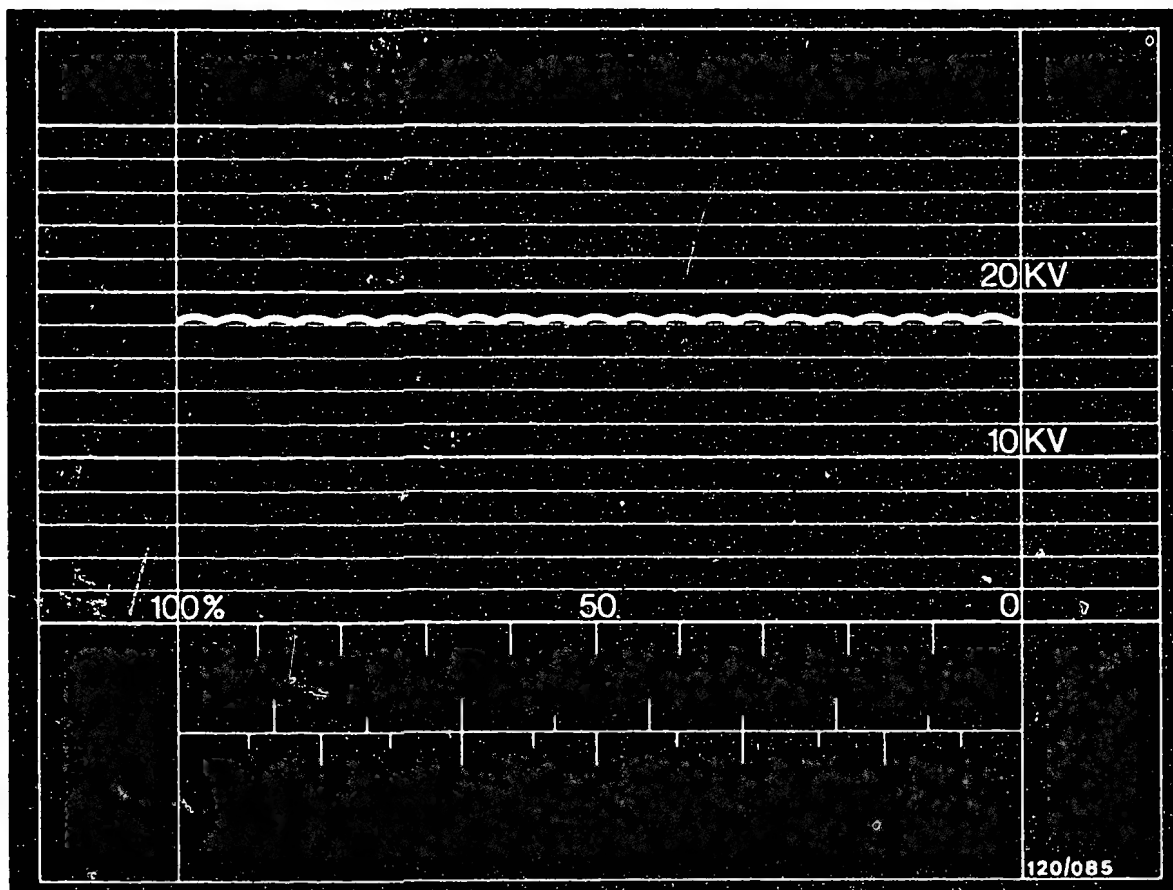


Testing with oscilloscope

Connect oscilloscope (MOT 002.00) to the alternator using corresponding test lead.

Red clip (1) to terminal D+.

Black clip (2) to terminal B- (ground).



Oscilloscope display O.K.:

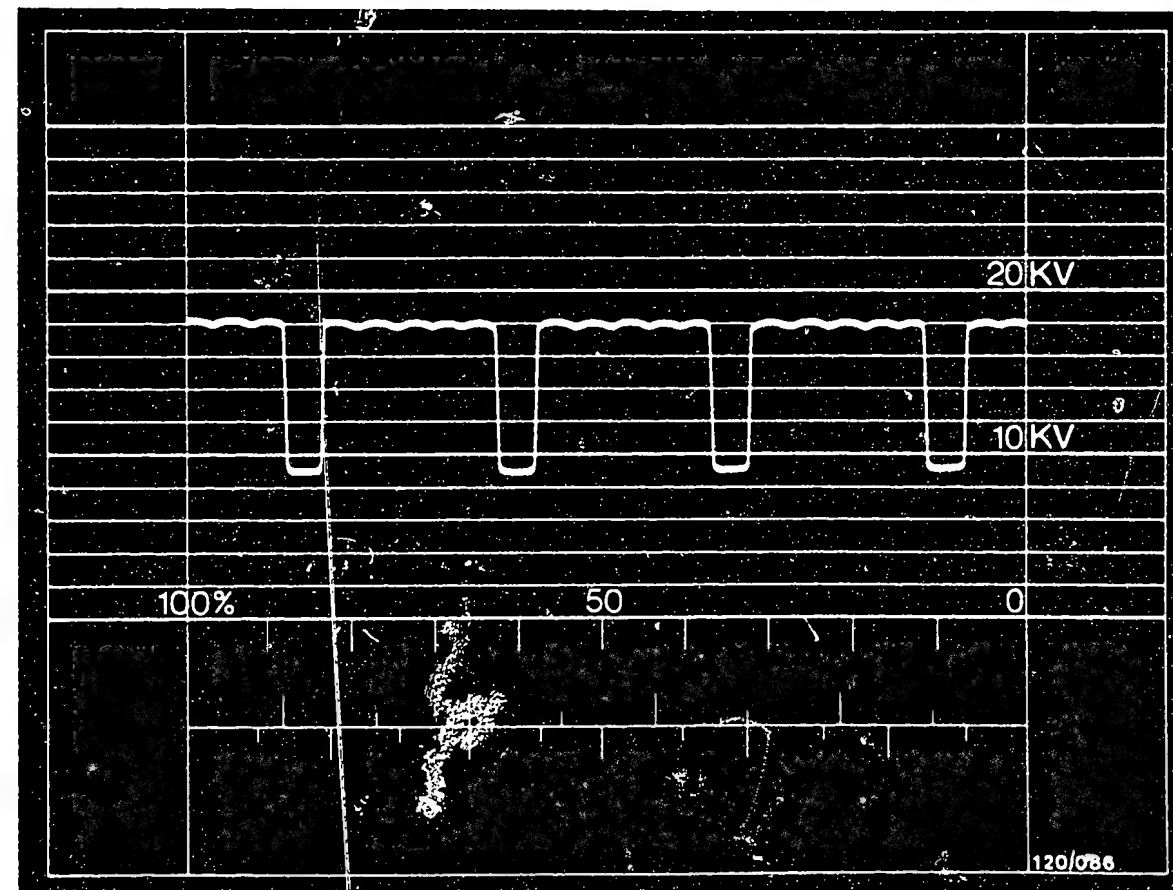
If the alternator is O.K., the above oscilloscope pattern will be displayed. The DC voltage has a slight ripple.

The pattern can exhibit small peaks when the voltage regulator comes into operation. The regulator can be stopped by means of switching loads (e.g. load resistor).

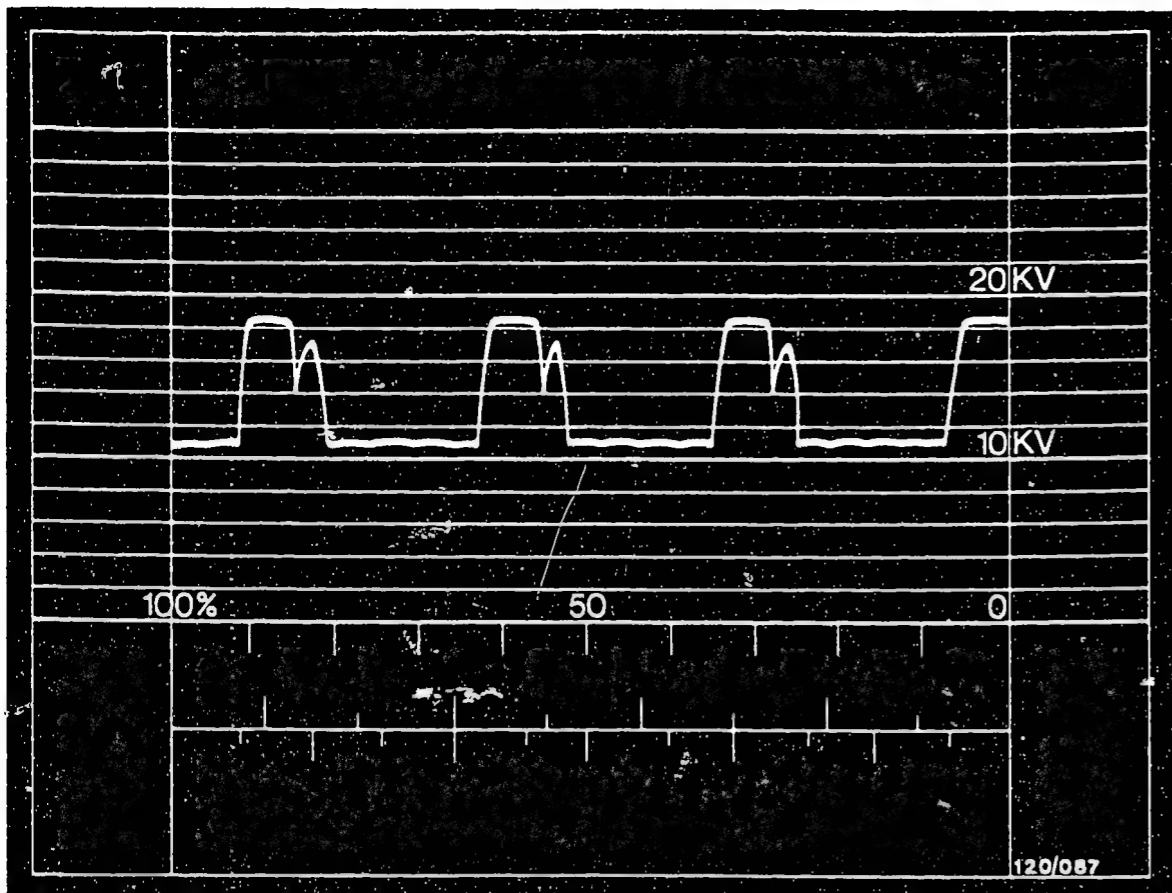
Adjust the pattern height so that the ripple is contained between two adjacent kV lines.

In order to be able to compare such patterns, the pattern concerned is to be adjusted with the vertical control of the oscilloscope so that it fits approximately between the 10 kV and 20 kV lines.

N o t e : More than one defect may be present at one time.

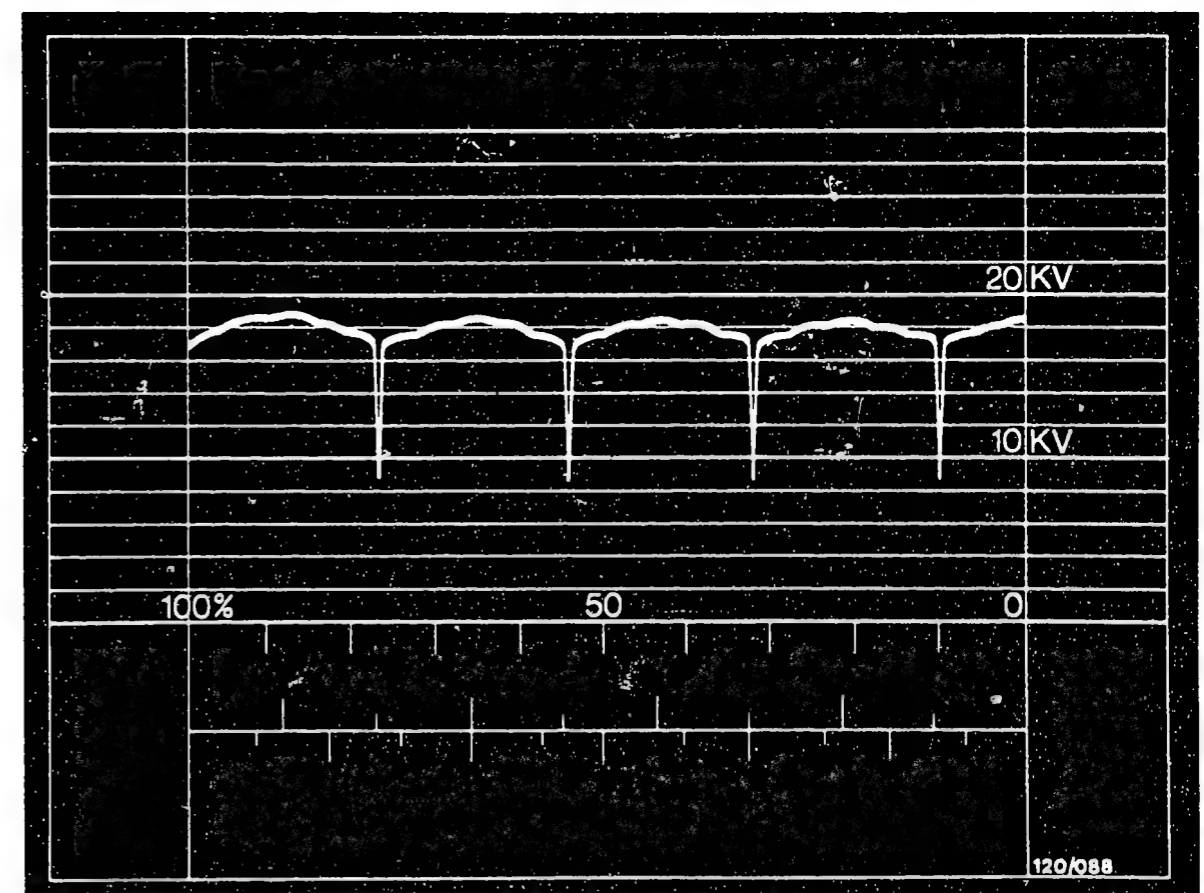


Oscilloscope display shows open circuit in an exciter diode



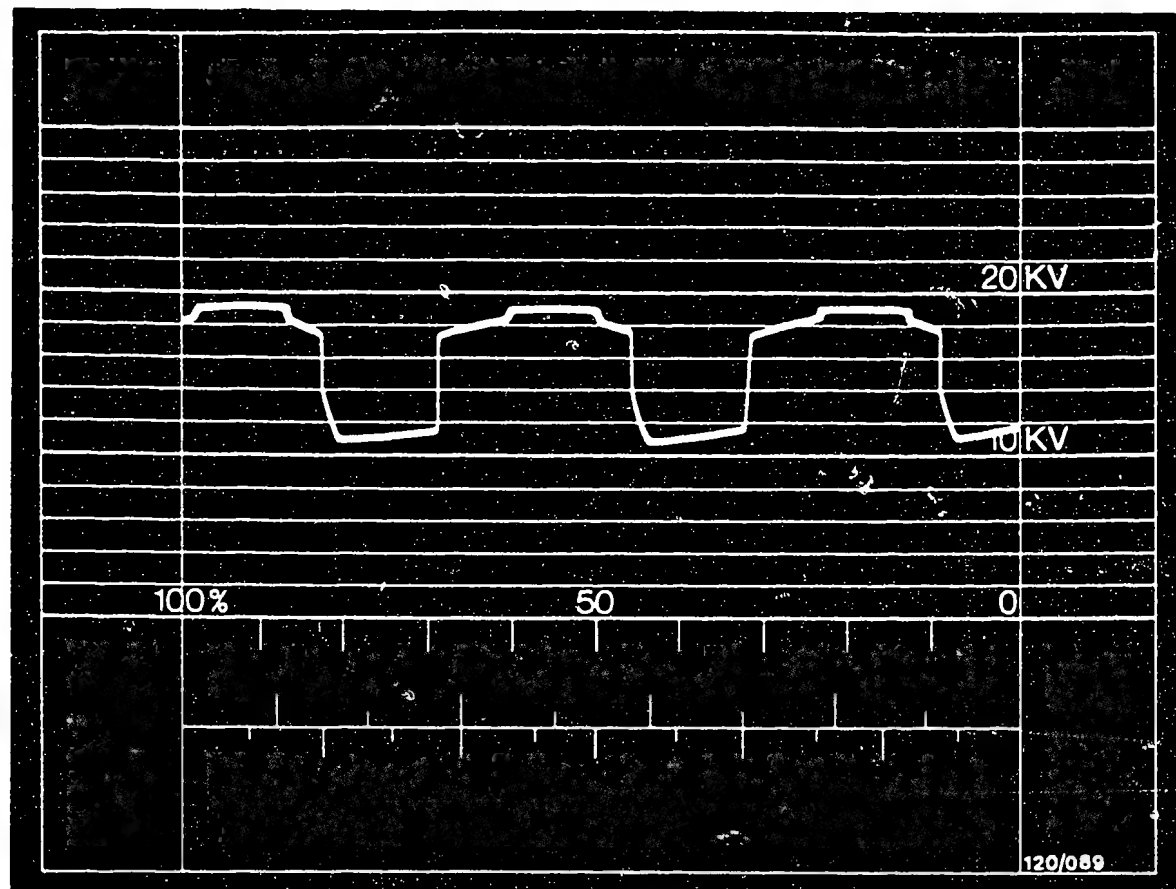
Oscilloscope display shows open circuit in a positive diode.

If several diodes in an alternator are connected in parallel, this oscilloscope display appears only if there is an open circuit in all diodes.

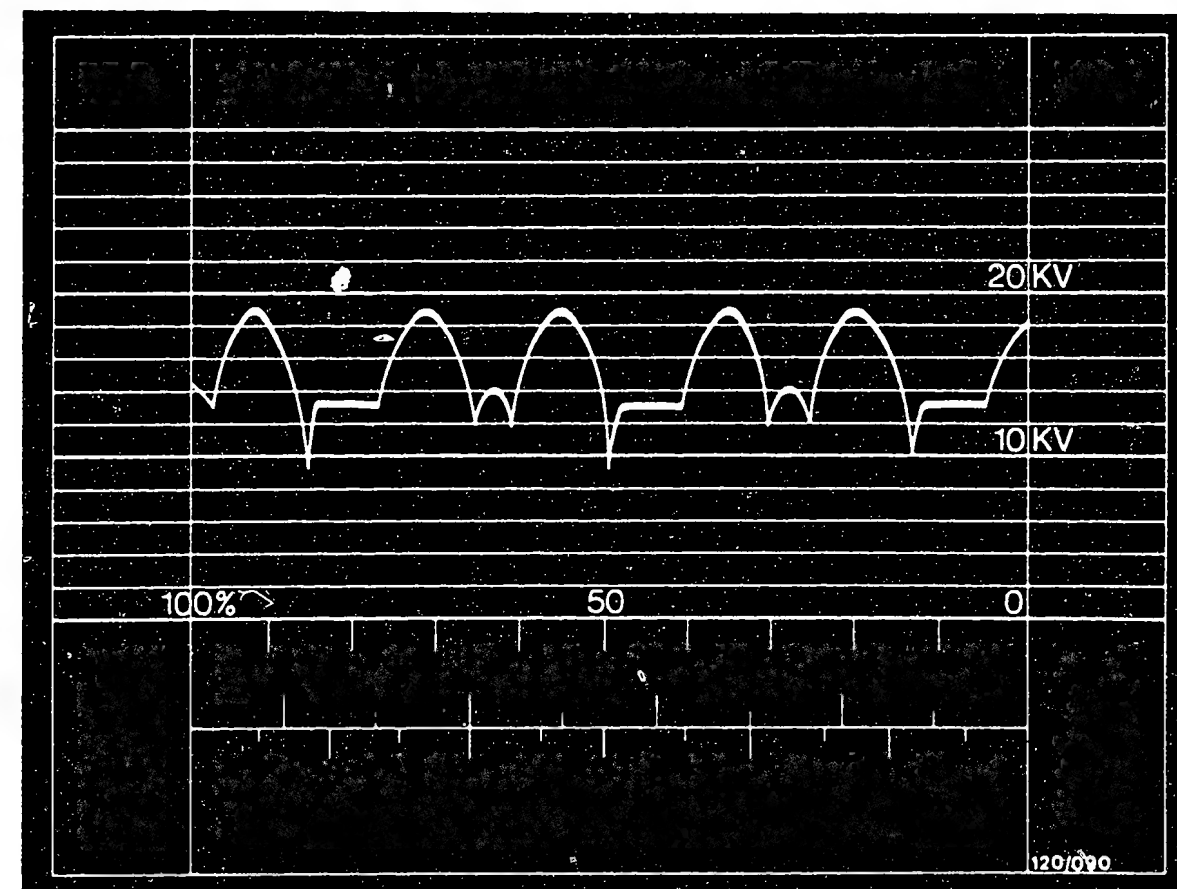


Oscilloscope display shows open circuit in a negative diode.

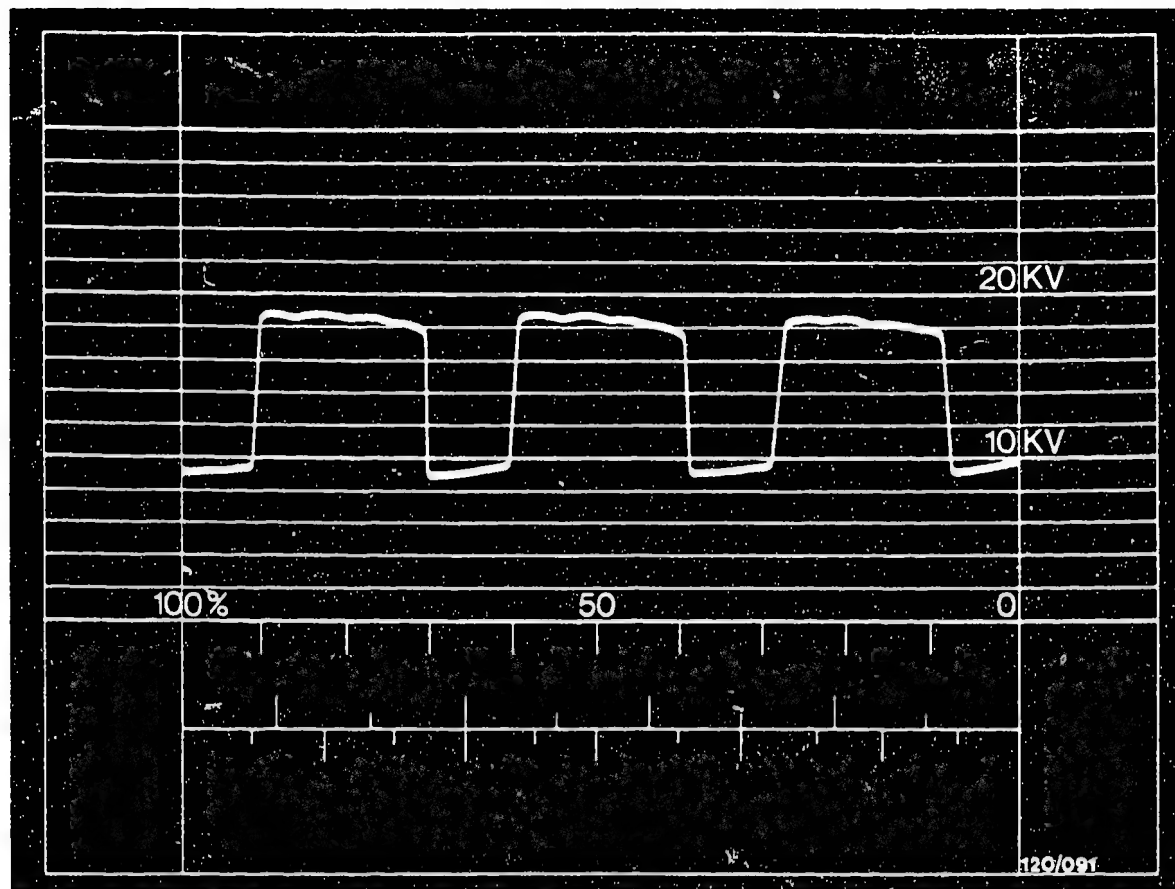
If several diodes in an alternator are connected in parallel, this oscilloscope display appears only if there is a short circuit in all diodes.



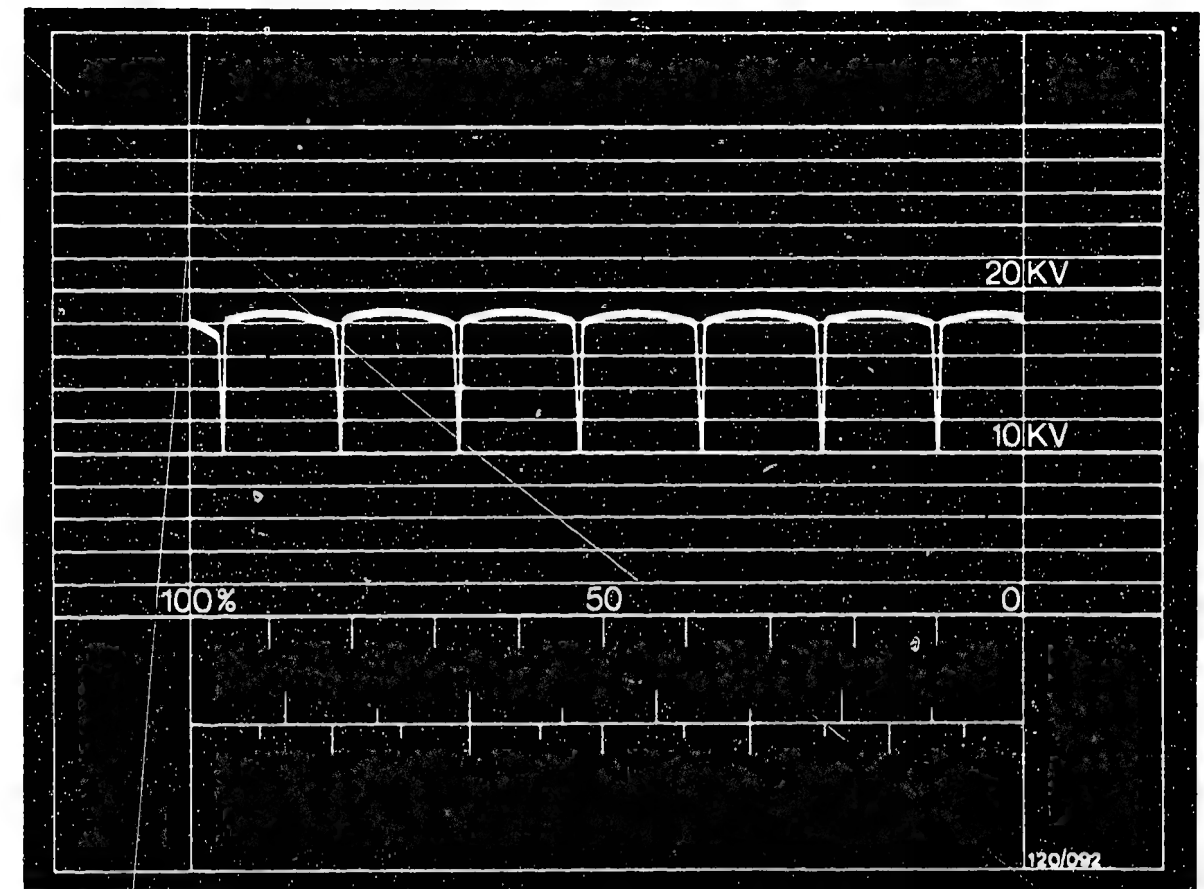
Oscilloscope display shows short circuit in an exciter diode.



Oscilloscope display shows short circuit in one or more positive diodes.



Oscilloscope display shows short circuit in one or more negative diodes.



Oscilloscope display shows phase defect (open circuit)

TECHNICAL BULLETIN

PARTS CLEANING

Gen.
VDT-I-Gen. / 18

Use of highly inflammable cleaning agents or cleaning agents which are dangerous to health

05.1978

When cleaning parts which come from vehicle electrical products prior to repair, it is permitted to use the following cleaning agents: benzine, trichloroethylene and perchloroethylene. These are dangerous, and must be handled with appropriate care. The relevant safety regulations in West Germany are:

- Regulations concerning work with inflammable liquids (VbF) issued by the Federal Labor Ministry (BmA).
- Safety regulations for the use of chlorinated hydrocarbons as applied to the works ZH1/222 as applied to personnel ZH1/119 as issued by the Federation of the Trade Co-operative Associations (Central Association for Accident Prevention and Industrial Medicine) Langwartweg 103, D-5300 Bonn 5.

1. Benzine, acetone and ethanol (ethyl alcohol) are inflammable liquids and their mixtures with air are dangerous due to the risk of explosion. Parts washing may only take place in tanks or containers solely intended for the purpose and equipped with a "melt" safety device for the lid which, in case the liquid catches fire, causes the lid to close automatically and to smother the fire. In the case of larger containers (exceeding 500 x 500 mm) some form of suction extraction must be provided.

- 1.1 Alternators, windshield-wiper motors, small motors, and other electric vehicle equipment increasingly include capacitors with long storage times (e.g. for interference suppression of receivers and transmitting equipment).

When washing out such parts, it is possible that immersion in benzine can lead to a discharging of the capacitor which can ignite combustible fluids. For this reason, parts with capacitors should only be washed in trichloroethylene or tetrachloroethylene.

- 1.2 In the case of starting motors, previous repair instructions have already made mention of the fact that when washing out parts, in particular windings in benzine, the parts must be well dried. With sliding-gear starting motors the first starting procedure after washing must take place on a test bench without the closure cap on in order to prevent explosion.

2. Trichloroethylene and tetrachloroethylene are fluids whose vapors can have a narcotic effect, and which present a health hazard if inhaled for long periods of time. Trichloroethylene vapors are heavier than air, so that the danger is greater near the ground. When washing out, wear protective eyewear and gloves.

Cleaning with trichloroethylene at regular intervals or continuously must be carried out only in special-purpose containers with exhaust switched on. When washing out, do not lean over the trichloroethylene container.

TECHNICAL BULLETIN

FAN PULLEYS OF STEEL SHEET
FOR ALTERNATORS

00...12
VDT-I-120/103 En
1st Suppl. 5.1977

Assembly instructions

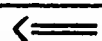
When assembling the fan pulley, make certain that the accessories are fitted in the correct sequence and position, in particular, the new supporting plate.

Published by:

Robert Bosch GmbH
Division KH
After-Sales Service Department for
Training and Technology (KH/VSK)

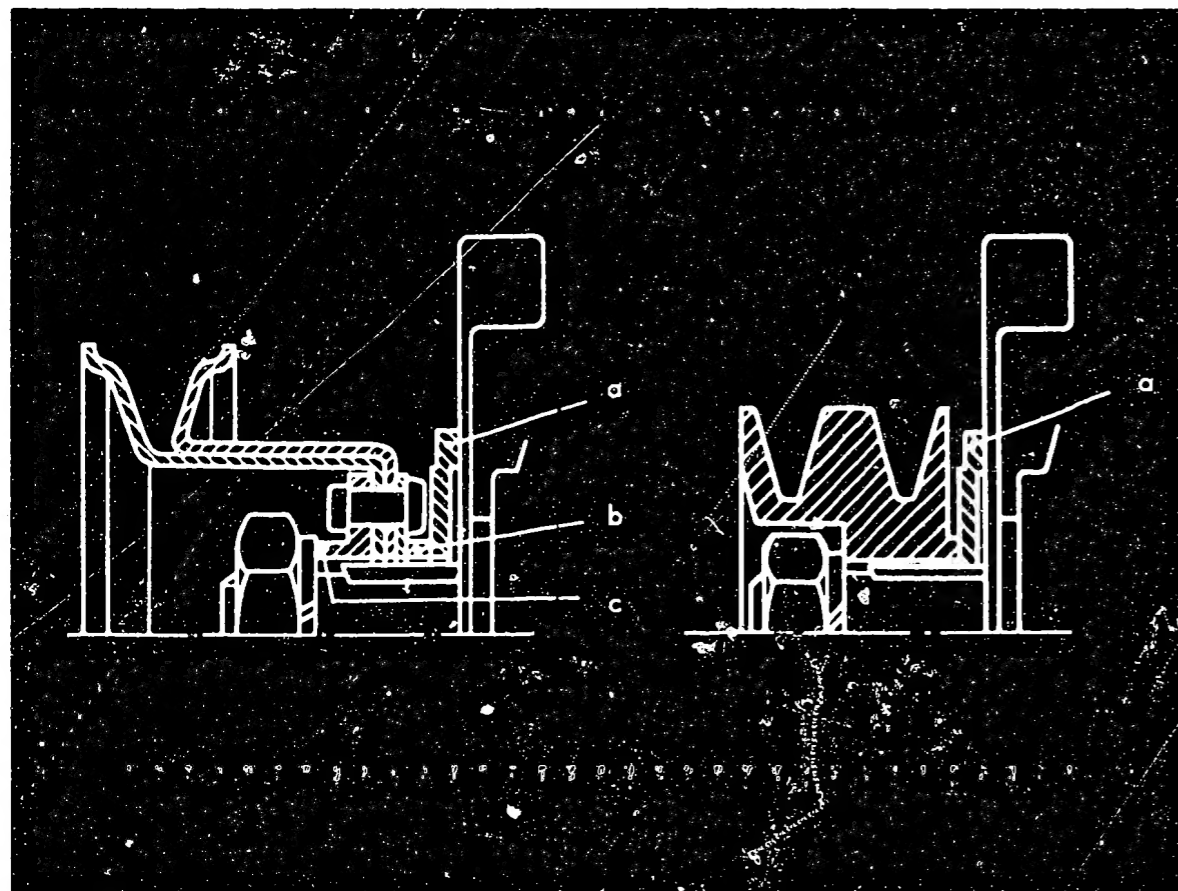
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N03



N04





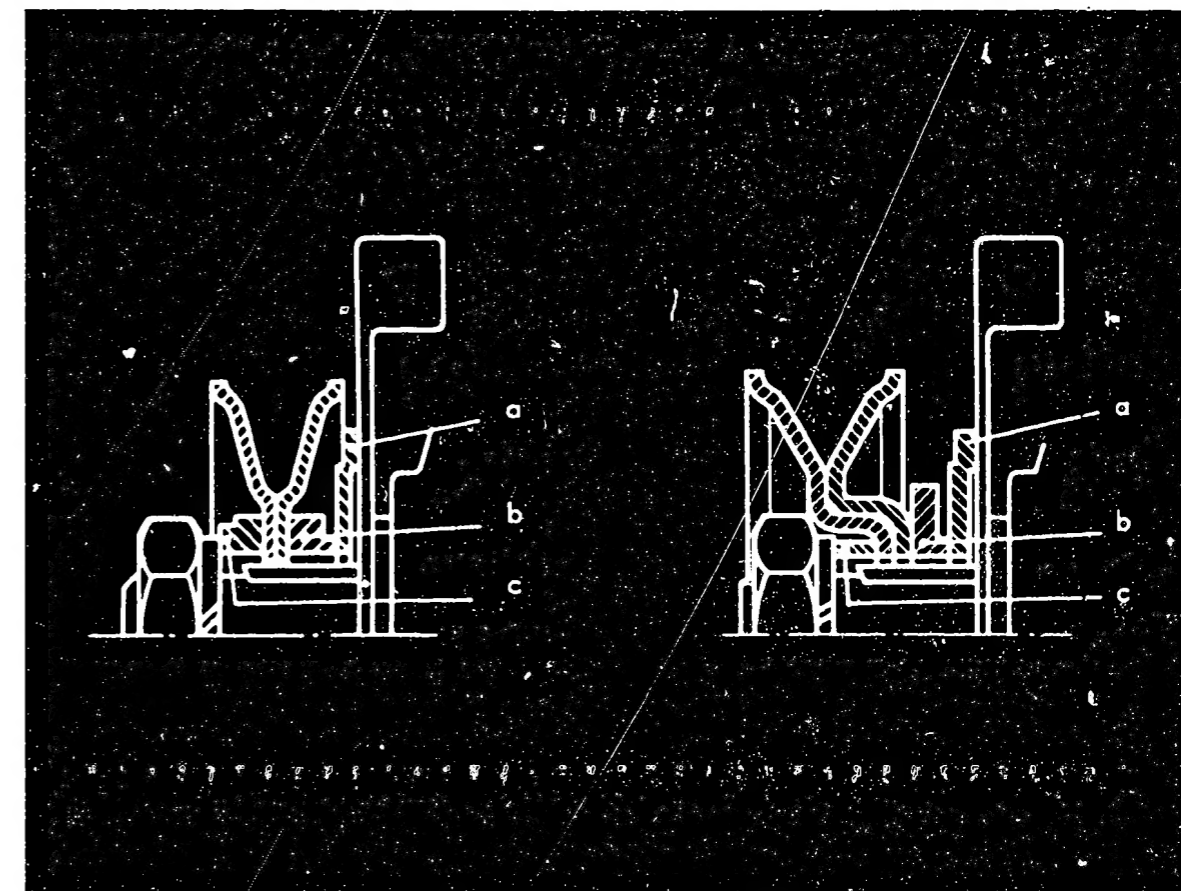
Example of assembly for supporting plate:

Left illustration: Drawn, one-piece sheet-steel belt pulley

Right illustration: Solid, one-piece belt pulley

Description of individual parts:

- a = Supporting plate 1 120 140 009
- b = Rear slotted washer
- c = Front slotted washer



Example of assembly for supporting plate

Left illustration: Two-piece sheet-steel belt pulley

Right illustration: Crimped, two-piece sheet-steel belt pulley

Description of individual parts:

- a = Supporting plate 1 120 140 009
- b = Rear slotted washer
- c = Front slotted washer

Since late 1976, in the course of further development supporting plate 1 120 140 009 has been installed between the fan and belt-pulley assembly on various alternators having sheet-steel fans.

This new supporting plate (item a) has an external diameter of 55 mm. The 5 mm wide and approx. 0.3 mm high raised area on the rim presses against the fan. On the side facing the belt pulley, depending on the alternator version there is a slotted washer (item b), or the belt pulley is mounted directly on the plate. Note that the slotted washer or belt pulley presses against the support plate with the 26 mm-diameter shoulder.

With belt pulleys made of sheet steel, a second slotted washer (item c) is located between the belt pulley and spring lock washer. The spring washer or spring lock washer and fastening nut remain unchanged.

The tightening torque of the entire assembly is 35...45 Nm (approx. 3.5...4.5 mkg) as before.

Tool KDLJ 6006 is required to hold the belt pulley when tightening the nut.

Under no circumstances may the fan be blocked with a screwdriver or other tool. Bent or damaged fan blades will damage the alternator.

Alternators on which a supporting plate has been installed at the factory must retain this plate in repair.

Service-parts documents and packing slips in service-parts packages are a basic source of information on use.

Supporting plate 1 120 140 009 is included in the scope of delivery of the belt pulley.

The entire assembly is adjusted to the alignment of the V-belt. Changes or mistakes in assembly can cause damage.

Preventative replacement of sheet-steel fans as part of replacement or repair of the alternator after more than 100,000 km or 2000 operating hours is still recommended.

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Initiated by: K1/VAK21

DAMAGE TO THE DRIVE-END-BEARING
HOUSING WHEN PRESSING OUT THE ROTOR
ON VW AND AUDI ALTERNATORS
Alternator 0 120 4..

VDT-I-120/115 En

03.1981

Due to the conversion of certain K-
alternators for VW and Audi to drive-end
bearings, press-fitted to the shaft, the
drive end shield or support plate which is
screwed from the inside on these
alternators, may be damaged when the rotor
is pressed out.

When pressing out the rotor, a three-arm
puller, part no. 57-036 from the firm of
Schrem in D-7928 Giengen 1, Postfach 1504,
should be used.

Apply the puller to the drive-end bearing,
in such a manner that the arms grip behind
the support plate. Only in this way can
one guarantee that the fastening screws will
not be broken off when the rotor is pressed
out.

For production reasons:
continued on the following
coordinate.

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IMPRESSUM

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